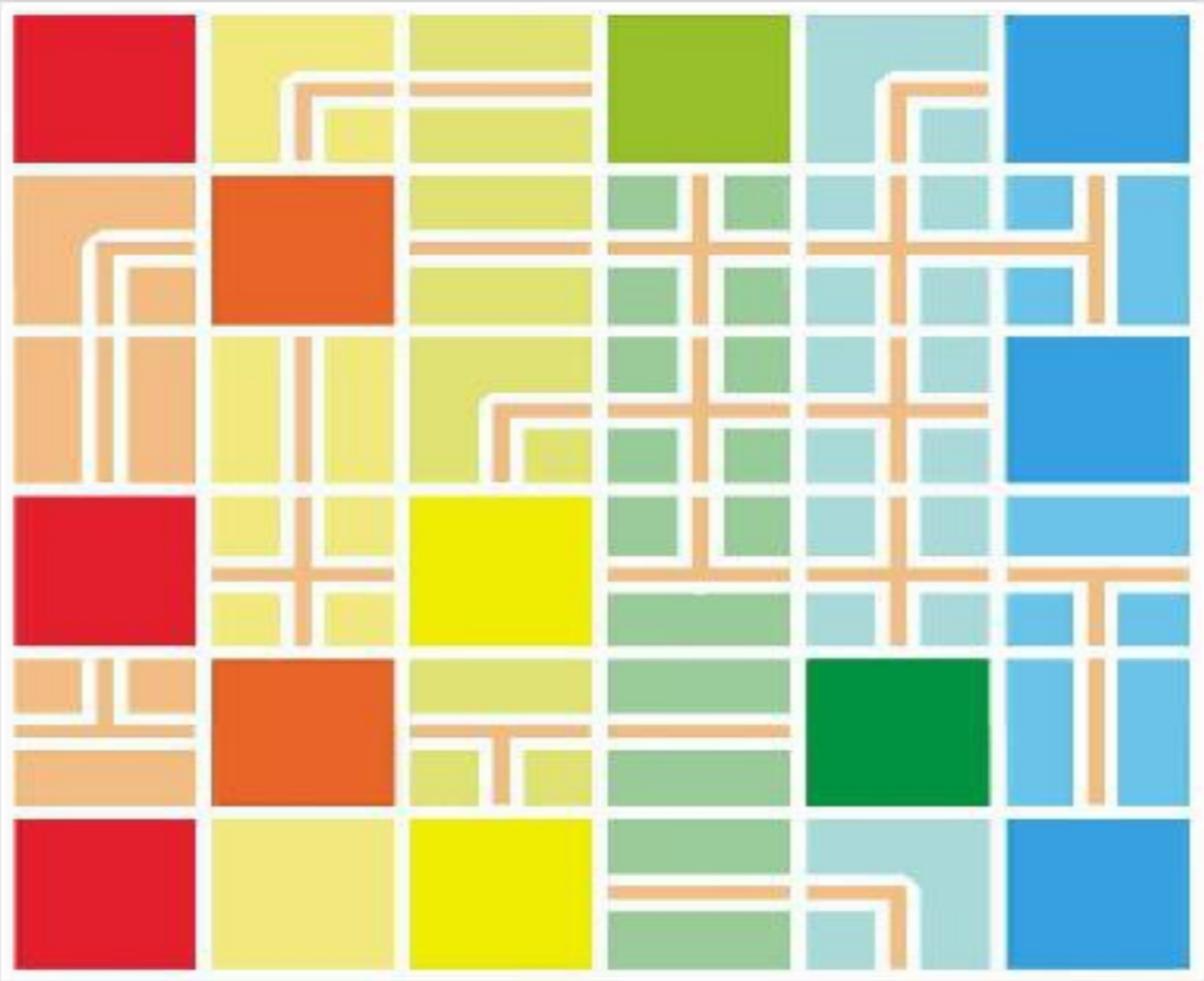
How to Take Smart Notes

One Simple Technique to Boost Writing, Learning and Thinking - for Students, Academics and Nonfiction Book Writers



Sönke Ahrens

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One Simple Technique to Boost Writing, Learning and Thinking – for Students, Academics and Nonfiction Book Writers.

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“Notes on paper, or on a computer screen [...] do not make contemporary physics or other kinds of intellectual endeavor easier, they make it possible … no matter how internal processes are implemented [...you..] need to understand the extent to which the mind is reliant upon external scaffolding.” (Levy 2011, 270)

“One cannot think without writing.” (Luhmann 1992, 53)

Table of Contents

Introduction
1 Everything You Need to Know
2 Everything You Need to Do
3 Everything You Need to Have
4 A Few Things to Keep in Mind
The Four Underlying Principles
5 Writing Is the Only Thing That Matters
6 Simplicity Is Paramount
7 Nobody Ever Starts From Scratch
8 Let the Work Carry You Forward
The Six Steps to Successful Writing
9 Separate and Interlocking Tasks
10 Read for Understanding
11 Take Smart Notes
12 Develop Ideas
13 Share Your Insight
14 Make It a Habit
Afterword
Bibliography
Index

INTRODUCTION

Everybody writes. Especially in academia. Students write and professors write. And nonfiction writers, who are the third group of people this book is aiming to help, obviously write as well. And writing doesn't necessarily mean papers, articles or books, but everyday, basic writing. We write when we need to remember something, be it an idea, a quote or the outcome of a study. We write when we want to organise our thoughts and when we want to exchange ideas with others. Students write when they take an exam, but the first thing they do to prepare even for an oral examination is to grab pen and paper. We write down not only those things we fear we won't remember otherwise, but also the very things we try to memorise. Every intellectual endeavour starts with a note.

Writing plays such a central role in learning, studying and research that it is surprising how little we think about it. If writing is discussed, the focus lies almost always on the few exceptional moments where we write a lengthy piece, a book, an article or, as students, the essays and theses we have to hand in. At first glance, that makes sense: these are the tasks that cause the most anxiety and with which we struggle the longest. Consequently, these "written pieces" are also what most self-help books for academics or study guides focus on, but very few give guidance for the everyday note-taking that takes up the biggest chunk of our writing.

The available books fall roughly into two categories. The first teaches the formal requirements: style, structure or how to quote correctly. And then there are the psychological ones, which teach you how to get it done without mental breakdowns and before your supervisor or publisher starts refusing to move the deadline once more. What they all have in common, though, is that they start with a blank screen or sheet of paper.[1] But by doing this, they ignore the main part, namely note-taking, failing to understand that improving the *organisation* of all writing makes a difference. They seem to forget that the process of writing starts much, much earlier than that blank screen and that the actual writing down of the argument is the smallest part of its development. This book aims to fill this gap by showing you how to

efficiently turn your thoughts and discoveries into convincing written pieces and build up a treasure of smart and interconnected notes along the way. You can use this pool of notes not only to make writing easier and more fun for yourself, but also to learn for the long run and generate new ideas. But most of all, you can write every day in a way that brings your projects forward.

Writing is not what follows research, learning or studying, it is the *medium* of all this work. And maybe that is the reason why we rarely think about this writing, the everyday writing, the note-taking and draft-making. Like breathing, it is vital to what we do, but because we do it constantly, it escapes our attention. But while even the best breathing technique would probably not make much of a difference to our writing, any improvement in the way we organise the everyday writing, how we take notes of what we encounter and what we do with them, will make all the difference for the moment we do face the blank page/screen – or rather *not*, as those who take smart notes will never have the problem of a blank screen again.

There is another reason that note-taking flies mostly under the radar: We don't experience any immediate negative feedback if we do it badly. But without an immediate experience of failure, there is also not much demand for help. And the publishing market working how it works, there is not much help in supply for this lack of demand either. It is the panic in front of the blank screen that brings students and academic writers to turn to the bookshelves full of self-help books on writing, a market publishers meet in droves by focusing on how to deal with this horse-has-already-left-the-barn situation. If we take notes unsystematically, inefficiently or simply wrong, we might not even realise it until we are in the midst of a deadline panic and wonder why there always seem to be a few who get a lot of good writing done and still have time for a coffee every time we ask them. And even then, it is more likely that some form of rationalization will cloud the view of the actual reason, which is most likely the difference between good and bad note-taking. "Some people are just like that," "writing has to be difficult," "the struggle is part of the deal" are just a few of the mantras that keep too many from inquiring what exactly distinguishes successful writing strategies from less successful ones.

The right question is: What can we do differently in the weeks, months or even years *before* we face the blank page that will get us into the best possible position to write a great paper easily? Very few people struggle with

their papers because they don't know how to cite correctly or because they suffer from a psychological issue that keeps them from writing. Few struggle to text their friends or write emails. The rules of citation can be looked up and there is no way that there are as many mental issues as papers postponed. Most people struggle for much more mundane reasons, and one is the myth of the blank page itself. They struggle *because* they believe, as they are made to believe, that writing starts with a blank page. If you believe that you have indeed nothing at hand to fill it, you have a very good reason to panic. Just having it all in your head is not enough, as getting it down on paper is the hard bit. That is why good, productive writing is based on good note-taking. Getting something that is already written into another written piece is incomparably easier than assembling everything in your mind and then trying to retrieve it from there.

To sum it up: The quality of a paper and the ease with which it is written depends more than anything on *what you have done in writing before you even made a decision on the topic*. But if that is true (and I wholeheartedly believe it is), and the key to successful writing lies in the preparation, it also means that the vast majority of self-help books and study guides can only help you to close the barn door correctly and according to official rules – not just a moment, but many months after the horse has already escaped.

With that in mind, it is not surprising that the single most important indicator of academic success is not to be found in people's heads, but in the way they do their everyday work. In fact, there is no measurable correlation between a high IQ and academic success – at least not north of 120. Yes, a certain intellectual capacity helps to get into academia, and if you struggle severely with an IQ test, it is likely that you will struggle to solve academic problems, too. But once you are in, a superior IQ will neither help you to distinguish yourself nor protect you from failure. What *does* make a significant difference along the whole intelligence spectrum is something else: how much self-discipline or self-control one uses to approach the tasks at hand (Duckworth and Seligman, 2005; Tangney, Baumeister, and Boone, 2004).

It is not so important who you are, but what you do. Doing the work required and doing it in a smart way leads, somehow unsurprisingly, to success. At first glance, this is both good and bad news. The good news is that we wouldn't be able to do much about our IQ anyway, while it seems to

be within our control to have more self-discipline with a little bit of willpower. The bad news is that we do not have this kind of control over ourselves. Self-discipline or self-control is not that easy to achieve with willpower alone. Willpower is, as far as we know today,[2] a limited resource that depletes quickly and is also not that much up for improvement over the long term (Baumeister, Bratslavsky, Muraven, and Tice, 1998; Muraven, Tice, and Baumeister, 1998; Schmeichel, Vohs, and Baumeister, 2003; Moller, 2006). And who would want to flog oneself to work, anyway?

Luckily, this is not the whole story. We know today that self-control and self-discipline have much more to do with our *environment* than with ourselves (cf. Thaler, 2015, ch. 2) – and the environment can be changed. Nobody needs willpower not to eat a chocolate bar when there isn't one around. And nobody needs willpower to do something they wanted to do anyway. Every task that is interesting, meaningful and well-defined will be done, because there is no conflict between long- and short-term interests. Having a meaningful and well-defined task beats willpower every time. Not *having* willpower, but *not having to use* willpower indicates that you set yourself up for success. This is where the organisation of writing and note-taking comes into play.

1 Everything You Need to Know

Until now, writing and note-taking techniques were usually taught without much regard to the overarching workflow. This book aims to change that. It will present you with the tools of note-taking that turned the son of a brewer into one of the most productive and revered social scientists of the 20th century. But moreover, it describes how he implemented them into his workflow so he could honestly say: “I never force myself to do anything I don’t feel like. Whenever I am stuck, I do something else.” A good structure allows you to do that, to move seamlessly from one task to another – without threatening the whole arrangement or losing sight of the bigger picture.

A good structure is something you can trust. It relieves you from the burden of remembering and keeping track of everything. If you can trust the system, you can let go of the attempt to hold everything together *in your head* and you can start focusing on what is important: The content, the argument and the ideas. By breaking down the amorphous task of “writing a paper” into small and clearly separated tasks, you can focus on one thing at a time, complete each in one go and move on to the next one (Chapter 3.1). A good structure enables *flow*, the state in which you get so completely immersed in your work that you lose track of time and can just keep on going as the work becomes effortless (Csikszentmihalyi, 1975). Something like that does not happen by chance.

As students, researchers and nonfiction writers, we have so much more freedom than others to choose what we want to spend our time on. Still, we often struggle the most with procrastination and motivation. It is certainly not the lack of interesting topics, but rather the employment of problematic work routines that seems to take charge of us instead of allowing us to steer the process in the right direction. A good, structured workflow puts us back in charge and increases our freedom to do the right thing at the right time.

Having a clear structure to work *in* is completely different from making plans *about* something. If you make a plan, you impose a structure *on yourself*; it makes you inflexible. To keep going according to plan, you have to push yourself and employ willpower. This is not only demotivating, but also unsuitable for an open-ended process like research, thinking or studying

in general, where we have to adjust our next steps with every new insight, understanding or achievement – which we ideally have on a regular basis and not just as an exception. Even though planning is often at odds with the very idea of research and learning, it is the mantra of most study guides and self-help books on academic writing. How do you plan for insight, which, by definition, cannot be anticipated? It is a huge misunderstanding that the only alternative to planning is aimless messing around. The challenge is to structure one's workflow in a way that insight and new ideas can become the driving forces that push us forward. We do not want to make ourselves dependent on a plan that is threatened by the unexpected, like a new idea, discovery – or insight.

Unfortunately, even universities try to turn students into planners. Sure, planning will get you through your exams if you stick to them and push through. But it will not make you an expert in the art of learning/writing/note-taking (there is research on that: cf. Chapter 1.3). Planners are also unlikely to continue with their studies after they finish their examinations. They are rather glad it is over. Experts, on the other hand, would not even consider voluntarily giving up what has already proved to be rewarding and fun: learning in a way that generates real insight, is accumulative and sparks new ideas. The fact that you invested in this book tells me that you would rather be an expert than a planner.

And if you are a student seeking help with your writing, the chances are that you already aim high too, because it is usually the best students who struggle the most. Good students wrestle with their sentences because they care about finding the right expression. It takes them longer to find a good idea to write about because they know from experience that the first idea is rarely that great and good questions do not fall into their laps. They spend more time in the library to get a better overview of the literature, which leads to more reading, which means that they have to juggle more information. Having read more does not automatically mean having more ideas. Especially in the beginning, it means having fewer ideas to work with, because you know that others have already thought of most of them.

Good students also look beyond the obvious. They peek over the fences of their own disciplines – and once you have done that, you cannot go back and do what everyone else is doing, even if you now must deal with heterogeneous ideas that come without a manual on how they might fit

together. All that means is that a system is needed to keep track of the ever-increasing pool of information, which allows one to combine different ideas in an intelligent way with the aim of generating new ideas.

Poor students do not have any of these problems. As long as they stick within the boundaries of their discipline and read only as much as they are told to (or less), no serious external system is required and writing can be done by sticking with the usual formulas of "how to write a scientific paper." In fact, poor students often *feel* more successful (until they are tested), because they don't experience much self-doubt. In psychology, this is known as the Dunning-Kruger effect (Kruger and Dunning, 1999). Poor students lack insight into their own limitations – as they would have to know about the vast amount of knowledge out there to be able to see how little they know in comparison. That means that those who are not very good at something tend to be overly confident, while those who have made an effort tend to underestimate their abilities. Poor students also have no trouble finding a question to write about: they neither lack opinions nor the confidence that they have already thought them through. They also won't have trouble finding confirming evidence in the literature as they usually lack both interest and skill to detect and think through dis-confirming facts and arguments.

Good students, on the other hand, constantly raise the bar for themselves as they focus on what they haven't learned and mastered yet. This is why high achievers who have had a taste of the vast amount of knowledge out there are likely to suffer from what psychologists call imposter syndrome, the feeling that you are not really up to the job, even though, of all people, they are (Clance and Imes 1978; Brems et al. 1994). This book is for you, the good students, ambitious academics and curious nonfiction writers who understand that insight doesn't come easy and that writing is not only for proclaiming opinions, but the main tool to achieve insight worth sharing.

1.1 Good Solutions are Simple – and Unexpected

There is no need to build a complex system and there is no need to reorganise everything you already have. You can start working and developing ideas immediately by taking smart notes.

Complexity is an issue, though. Even if you don't aim to develop a grand theory and just want to keep track of what you read, organise your notes and develop your thoughts, you will have to deal with an increasingly complex

body of content, especially because it is not just about collecting thoughts, but about making connections and sparking new ideas. Most people try to reduce complexity by separating what they have into smaller stacks, piles or separate folders. They sort their notes by topics and sub-topics, which makes it look less complex, but quickly becomes very complicated. Plus, it reduces the likelihood of building and finding surprising connections between the notes themselves, which means a trade-off between its usability and usefulness.

Thankfully, we don't have to choose between usability and usefulness. Quite the contrary. The best way to deal with complexity is to keep things as simple as possible and to follow a few basic principles. The simplicity of the structure allows complexity to build up where we want it: on the content level. There is quite extensive empirical and logical research on this phenomenon (for an overview: cf. Sull and Eisenhardt, 2015). Taking smart notes is as simple as it gets.

Another item of good news regards the amount of time and effort you have to put into getting started. Even though you will change considerably the way you read, take notes and write, there is almost no preparation time needed (except for understanding the principle and installing one or two free programs). It is not about redoing what you have done before, but about changing the way of working from now on. There is really no need to reorganise anything you already have. Just deal with things differently the moment you have to deal with them anyway.

There is more good news. There is no need to reinvent the wheel. We only need to combine two well-known and proven ideas. The first idea lies at the heart of this book and is the technique of the simple slip-box. I will explain the principle of this system in the next chapter and show how it can be implemented in the everyday routines of students, academics or nonfiction writers. Thankfully, there are digital versions for all major operating systems available, but if you prefer, you can also use pen and paper. In terms of productivity and ease, you will still easily surpass those who are taking not-so-smart notes.

The second idea is equally important. Even the best tool will not improve your productivity considerably if you don't change your daily routines the tool is embedded in, just as the fastest car won't help you much if you don't have proper roads to drive it on. Like every change in behaviour, a change in

working habits means going through a phase where you are drawn back to your old ways. The new way of working might feel artificial at first and not necessarily like what you intuitively would do. That is normal. But as soon as you get used to taking smart notes, it will feel so much more natural that you will wonder how you were ever able to get anything done before. Routines require simple, repeatable tasks that can become automatic and fit together seamlessly (cf. Mata, Todd, and Lippke, 2010). Only when all the related work becomes part of an overarching and interlocked process, where all bottlenecks are removed, can significant change take place (which is why none of the typical "10 mind-blowing tools to improve your productivity" tips you can find all over the internet will ever be of much help).

The importance of an overarching workflow is the great insight of David Allen's "Getting Things Done" (Allen, 2001). There are few serious knowledge workers left who haven't heard of "GTD" and that is for a good reason: It works. The principle of GTD is to collect everything that needs to be taken care of in one place and process it in a standardised way. This doesn't necessarily mean that we actually do everything we once intended to do, but it forces us to make clear choices and regularly check if our tasks still fit into the bigger picture. Only if we know that everything is taken care of, from the important to the trivial, can we let go and focus on what is right in front of us. Only if nothing else is lingering in our working memory and taking up valuable mental resources can we experience what Allen calls a "mind like water" - the state where we can focus on the work right in front of us without getting distracted by competing thoughts. The principle is simple but holistic. It is not a quick fix or a fancy tool. It doesn't do the work for you. But it does provide a structure for our everyday work that deals with the fact that most distractions do not come so much from our environment, but our own minds.

Unfortunately, David Allen's technique cannot simply be transferred to the task of insightful writing. The first reason is that GTD relies on clearly defined objectives, whereas insight cannot be predetermined by definition. We usually start with rather vague ideas that are bound to change until they become clearer in the course of our research (cf. Ahrens, 2014, 134f.). Writing that aims at insight must therefore be organised in a much more open manner. The other reason is that GTD requires projects to be broken down into smaller, concrete "next steps." Of course, insightful writing or academic

work is also done one step at a time, but these are most often too small to be worth writing down (looking up a footnote, rereading a chapter, writing a paragraph) or too grand to be finished in one go. It is also difficult to anticipate which step has to be taken after the next one. You might notice a footnote, which you check quickly on. You try to understand a paragraph and need to look up something for clarification. You make a note, go back to reading and then jump up to write down a sentence that formed itself in your mind.

Writing is not a linear process. We constantly have to jump back and forth between different tasks. It wouldn't make any sense to micromanage ourselves on that level. Zooming out to the bigger picture does not really help, either, because then we have next steps like "writing a page." That does not really help with navigating the things you have to do to write a page, often a whole bunch of other things that can take an hour or a month. One has to navigate mostly by sight. These are probably the reasons why GTD never really caught on in academia, although it is very successful in business and has a good reputation among the self-employed.

What we can take from Allen as an important insight is that the secret to a successful organization lies in the holistic perspective. Everything needs to be taken care of, otherwise the neglected bits will nag us until the unimportant tasks become urgent. Even the best tools won't make much of a difference if they are used in isolation. Only if they are embedded in a well-conceived working process can the tools play out their strengths. There is no point in having great tools if they don't fit together.

When it comes to writing, everything, from research to proofreading, is closely connected. All the little steps must be linked in a way that will enable you to go seamlessly from one task to another, but still be kept separate enough to enable us to flexibly do what needs to be done in any given situation. And this is the other insight of David Allen: Only if you can trust your system, only if you really know that everything will be taken care of, will your brain let go and let you focus on the task at hand.

That is why we need a note-taking system that is as comprehensive as GTD, but one that is suitable for the open-ended process of writing, learning and thinking. Enter the slip-box.

1.2 The Slip-box

It is the 1960s, somewhere in Germany. Among the staff of a German administration office is the son of a brewer. His name is Niklas Luhmann. He went to law school, but he has chosen to be a public servant, as he did not like the idea of having to work for multiple clients. Fully aware he is also not suited for a career in administration, as it involves a lot of socializing, he excuses himself every day after his 9-5 shift and goes home to do what he liked most: reading and following his diverse interests in philosophy, organizational theory and sociology.

Whenever he encountered something remarkable or had a thought about what he read, he made a note. Now, many people read in the evening and follow their interests, and some even take notes. But for very few is it the path to something as extraordinary as Luhmann's career.

After collecting notes for a while in the way most people do, commenting in the margins of a text or collecting handwritten notes by topic, Luhmann realised his note-taking was not leading anywhere. So he turned note-taking on its head. Instead of adding notes to existing categories or the respective texts, he wrote them all on small pieces of paper, put a number in the corner and collected them in one place: the slip-box.

He soon developed new categories of these notes. He realised that one idea, one note was only as valuable as its context, which was not necessarily the context it was taken from. So he started to think about how one idea could relate and contribute to different contexts. Just amassing notes in one place would not lead to anything other than a mass of notes. But he collected his notes in his slip-box in such a way that the collection became much more than the sum of its parts. His slip-box became his dialogue partner, main idea generator and productivity engine. It helped him to structure and develop his thoughts. And it was fun to work with – because it worked.

And it led him to enter academia. One day, he put some of these thoughts together into a manuscript and handed it over to Helmut Schelsky, one of the most influential sociologists in Germany. Schelsky took it home, read what this academic outsider had written and contacted Luhmann. He suggested that he should become a professor of sociology in the newly founded University of Bielefeld. As attractive and prestigious as this position was, Luhmann wasn't a sociologist. He didn't have the formal qualifications required even to become an assistant for a sociology professor in Germany. He hadn't written a habilitation, the highest academic qualification in many European

countries, which is based on the second book after the doctoral thesis. He had never held a doctorate or even obtained a sociology degree. Most people would take the offer as a huge compliment, but point out the impossibility of it and move on.

Not Luhmann. He turned to his slip-box and with its help he put together a doctoral thesis *and* the habilitation thesis in less than a year – while taking classes in sociology. Shortly after, in 1968, he was chosen to become professor of sociology at the University of Bielefeld – a position he would hold for the rest of his life.

In Germany, a professor traditionally starts with a public lecture presenting his or her projects, and Luhmann, too, was asked what his main research project will be. His answer would become famous. He laconically stated: "My project: theory of society. Duration: 30 years. Costs: zero" (Luhmann, 1997, 11). In sociology, a "theory of society" is the mother of all projects.

When he finished the final chapter, almost exactly 29 and a half years later, as a two-volume book with the title "The Society of Society" (1997), it stirred up the scientific community.[3] It was a radical new theory that not only changed sociology, but stirred heated discussions in philosophy, education, political theory and psychology as well. Not everyone was able to follow the discussions, though. What he did was unusually sophisticated, very different and highly complex. The chapters were published individually, each book discussing one social system. He wrote on law, politics, economy, communication, art, education, epistemology – and even love.

In 30 years, he published 58 books and hundreds of articles, translations not included. Many became classics in their respective fields. Even *after* his death, about half a dozen more books on diverse subjects like religion, education or politics were published in his name – based on almost finished manuscripts lying around in his office. There are more than a few colleagues I know who would give a lot to be as productive in their whole lifetime as Luhmann was after his death.

While some career-oriented academics try to squeeze as many publications out of one idea as possible, Luhmann seemed to do the opposite. He constantly generated more ideas than he was able to write down. His texts read as if he is trying to squeeze as much insight and as many ideas as possible into one publication.

When he was asked if he missed anything in his life, he famously answered: “If I want something, it’s more time. The only thing that really is a nuisance is the lack of time.” (Luhmann, Baecker, and Stanitzek, 1987, 139) And while some academics let their assistants do the main work or have a team that is writing the papers to which they add their names, Luhmann rarely had any assistance at all. The last assistant who worked for him swore blind that the only help he was able to give was to spot a few typos in his manuscripts here and there. Luhmann’s only real help was a housekeeper who cooked for him and his children during the week, not that extraordinary considering he had to raise three children on his own after his wife died early. Five warm meals a week of course do not explain the production of roughly 60 influential books and countless articles.

After doing extensive research on Luhmann’s workflow, the German sociologist Johannes F.K. Schmidt concluded his productivity could only be explained by his unique working technique (Schmidt 2013, 168). That technique has never been a secret – Luhmann was always open about it. He regularly mentioned the slip-box as the reason for his productivity. From as early as 1985, his standard answer to the question of how anyone could be so productive was: “I, of course, do not think everything by myself. It happens mainly within the slip-box” (Luhmann, Baecker, and Stanitzek 1987, 142). But few gave the slip-box and the way he worked with it a closer look, dismissing his explanation as the modest understatement of a genius.

His productivity is, of course, impressive. But what is even more impressive than the sheer number of publications or the outstanding quality of his writing is the fact that he seemed to achieve all this with almost no real effort. He not only stressed that he never forced himself to do something he didn’t feel like, he even said: “I only do what is easy. I only write when I immediately know how to do it. If I falter for a moment, I put the matter aside and do something else.” (Luhmann et al., 1987, 154f.)[4]

Until recently, almost no one really seemed to believe it. We are still so used to the idea that a great outcome requires great effort that we tend not to believe that a simple change in our work routines could not only make us more productive, but the work also more fun. But doesn’t it make much more sense that the impressive body of work was produced not in spite of the fact he never made himself do anything he didn’t feel like, but *because* of it?

Even hard work can be fun as long as it is aligned with our intrinsic goals and we feel in control. The problems arise when we set up our work in such an inflexible way that we can't adjust it when things change and become arrested in a process that seems to develop a life of its own.

The best way to maintain the feeling of being in control is to stay in control. And to stay in control, it's better to keep your options open during the writing process rather than limit yourself to your first idea. It is in the nature of writing, especially insight-oriented writing, that questions change, the material we work with turns out to be very different from the one imagined or that new ideas emerge, which might change our whole perspective on what we do. Only if the work is set up in a way that is flexible enough to allow these small and constant adjustments can we keep our interest, motivation and work aligned – which is the precondition to effortless or almost effortless work.

Luhmann was able to focus on the important things right in front of him, pick up quickly where he left off and stay in control of the process because the structure of his work allowed him to do this. If we work in an environment that is flexible enough to accommodate our work rhythm, we don't need to struggle with resistance. Studies on highly successful people have proven again and again that success is *not* the result of strong willpower and the ability to overcome resistance, but rather the result of smart working environments that avoid resistance in the first place (cf. Neal et al. 2012; Painter et al. 2002; Hearn et al. 1998). Instead of struggling with adverse dynamics, highly productive people deflect resistance, very much like judo champions. This is not just about having the right mindset, it is also about having the right workflow. It is the way Luhmann and his slip-box worked together that allowed him to move freely and flexibly between different tasks and levels of thinking. It is about having the right tools and knowing how to use them – and very few understand that you need both.

People still search for Luhmann's "secret," putting down his remarkable output to him being a genius or even thinking they only need his slip-box and they would be set. Sure, you need to be smart to be successful in academia and writing, but if you don't have an *external* system *to think in* and organise your thoughts, ideas and collected facts, or have no idea how to embed it in your overarching daily routines, the disadvantage is so enormous that it just can't be compensated by a high IQ.

As far as the technology is concerned, there is no secret. It has all been in the open for more than three decades now. So why is not everybody using a slip-box and working effortlessly towards success? Is it because it is too complicated? Certainly not. It is rather surprisingly simple. The reasons are much more mundane:

1. Until very recently, when the first results from the research on the file system were published, some crucial misunderstandings prevailed about how Luhmann actually worked, which led to disappointing results for many who tried to emulate the system. The main misunderstanding stems from an isolated focus on the slip-box and a neglect of the actual workflow in which it is embedded.
2. Almost everything that is published about this system was only accessible in German and was almost exclusively discussed within a small group of devoted sociologists who specialised in Luhmann's theory of social systems – hardly the kind of critical mass that would draw much attention.
3. The third and maybe the most important reason is the very fact that it is simple. Intuitively, most people do not expect much from simple ideas. They rather assume that impressive results must have equally impressively complicated means.

The contemporaries of Henry Ford did not understand why something as simple as the conveyor belt should be that revolutionary. What difference does it make to let the cars move from worker to worker instead of letting the workers walk from car to car? I would not be surprised if some of them even thought of Ford as a bit simpleminded and overly enthusiastic about a rather minor change in work organization. It is only in hindsight that the scale of the advantages of this small tweak became obvious to everyone. I wonder how long it will take until the advantages of Luhmann's slip-box and work routines become equally obvious to everyone. But by then, everyone will already have known it all along the way.

Whatever the reasons were: The word is out now and I wouldn't be surprised if it spreads fast.

1.3 The slip-box manual

How does the slip-box, the heart of this system, work?

Strictly speaking, Luhmann had two slip-boxes: a bibliographical one, which contained the references and brief notes on the content of the literature, and the main one in which he collected and generated his ideas, mainly in response to what he read. The notes were written on index cards and stored in wooden boxes.

Whenever he read something, he would write the bibliographic information on one side of a card and make brief notes about the content on the other side (Schmidt 2013, 170). These notes would end up in the bibliographic slip-box.

In a second step, shortly after, he would look at his brief notes and think about their relevance for his own thinking and writing. He then would turn to the main slip-box and write his ideas, comments and thoughts on new pieces of paper, using only one for each idea and restricting himself to one side of the paper, to make it easier to read them later without having to take them out of the box. He kept them usually brief enough to make one idea fit on a single sheet, but would sometimes add another note to extend a thought.

He usually wrote his notes with an eye towards already existing notes in the slip-box. And while the notes on the literature were brief, he wrote them with great care, not much different from his style in the final manuscript: in full sentences and with explicit references to the literature from which he drew his material. More often than not, a new note would directly follow up on another note and would become part of a longer chain of notes. He then would add references to notes somewhere else in the slip-box, some of them which were located nearby, others in completely different areas and contexts. Some were directly related and read more like comments, others contained not-so-obvious connections. Rarely would a note stay in isolation.

He did *not* just copy ideas or quotes from the texts he read, but made a transition from one context to another. It was very much like a translation where you use different words that fit a different context, but strive to keep the original meaning as truthfully as possible. Writing that an author struggles in one chapter to justify his method can be a much more adequate description of this chapter's content than any quote from the text itself (this would call for an explanation, of course).

The trick is that he did not organise his notes by topic, but in the rather abstract way of giving them fixed numbers. The numbers bore no meaning and were only there to identify each note permanently. If a new note was relevant or directly referred to an already existing note, such as a comment,

correction or addition, he added it directly behind the previous note. If the existing note had the number 22, the new note would become note number 23. If 23 already existed, he named the new note 22a. By alternating numbers and letters, with some slashes and commas in between, he was able to branch out into as many strings of thought as he liked. For example, a note about causality and systems theory carried the number 21/3d7a7 following a note with the number 21/3d7a6.

Whenever he added a note, he checked his slip-box for other relevant notes to make possible connections between them. Adding a note directly behind another note is only one way of doing this. Another way is by adding a link on this and/or the other note, which could be anywhere in the system. This very much resembles, of course, the way we use hyperlinks on the internet. But, as I will explain later, they are quite different and it would be rather misleading to think of his slip-box as a personal Wikipedia or a database on paper. The similarities are obviously there, but the subtle differences are what makes this system unique.

By adding these links between notes, Luhmann was able to add the same note to different contexts. While other systems start with a preconceived order of topics, Luhmann developed topics bottom up, then added another note to his slip-box, on which he would sort a topic by sorting the links of the relevant other notes.

The last element in his file system was an index, from which he would refer to one or two notes that would serve as a kind of entry point into a line of thought or topic. Notes with a sorted collection of links are, of course, good entry points.

That's it. Actually, it is even simpler than this, as we now have software that makes it much easier (cf. chapter 1.3): we don't need to manually add numbers on notes or cut out paper as Luhmann had to.[5]

Now that you know how the slip-box works, you only need to understand how to work with it. And the best way to understand this is to understand a little bit about the way we think, learn and develop ideas. And if I were forced to boil it down to a single bullet point, it would be this: We need a reliable and simple external structure to think in that compensates for the limitations of our brains. But first, let me guide you through the process of writing a paper with the slip-box.

2 Everything You Need to Do

Imagine you do *not* start with a clean sheet. Imagine instead some friendly genie (or well-paid personal assistant – whatever is more likely for you to have available) prepared a rough draft of your paper for you. It is already a fully developed argument including all references, quotes and some really smart ideas. The only thing left to do is to revise this rough draft and send it off. Make no mistake: there is still work to do and it is more than just finding some typos. Editing is work that needs focus. You have to rephrase some sentences, delete one or two redundancies and maybe add a couple of sentences or even passages to fill some holes left in the argument. But at the same time, it is a well-defined task: nothing that couldn't be done within a few days and certainly nothing you would have trouble motivating yourself to do: Everybody is motivated when the finish line is within reach. No problem so far.

Imagine now you are not the one who has to edit the rough draft and turn it into the final paper, but the one who has to prepare it. What would be helpful to achieve that quickly? It would certainly make things a lot easier if you already had everything you need right in front of you: The ideas, the arguments, the quotes, long developed passages, complete with bibliography and references. And not just readily available, but already in order, sorted by chapters that have descriptive headlines. Now that's also a clear assignment. No worries about perfect sentences (someone else will take care of that), no worries about finding things and coming up with ideas (someone else already took care of that), you just focus on turning a string of ideas into a continuous text. Again, that is still serious work and you have to put some effort into it, if you want to make it great. You might spot a missing step in an argument and have to fill it, or you might want to rearrange some notes or leave something out that you regard as less relevant. But, again, this is not an overwhelming task and luckily, it doesn't need to be perfect. No problem so far.

Equally manageable is the task of bringing already existing notes into order, especially if half of them already are in order. Searching through a file system with strings of discussions, plenty of material and ideas is, believe it or not, fun. It does not require the kind of focused attention you would need to formulate a sentence or to understand a difficult text. Your attention is

rather at ease and it even helps to have a playful mindset. Only with a less narrow focus will you be able to see connections and patterns. You see clearly where long strings of discussions have already been built up – this is a good starting point. If you do look for specific notes, you have an index to turn to. No problem at all so far.

At this point, it should become clear that you don't need to wait for a genie to appear, as each step is clearly not only within your abilities, but also straightforward and well defined: Assemble notes and bring them into order, turn these notes into a draft, review it and you are done.

Now, that's all well and good, you might say, but what about *writing* these notes? Obviously, it is easy to write a paper if the main part of the writing is already done and only needs to be turned into a linear text. But isn't that a little bit like saying: If you are short of money, just take what you need out of your piggy bank? Everyone can make things look easy by leaving out the main part. So, where is the genie for that?

Granted, writing these notes is the main work. It will take enormous amounts of effort, time, patience and willpower, and you will probably break under the weight of this task. Just kidding. It is the easiest part of all. Writing these notes is also not the main work. Thinking is. Reading is. Understanding and coming up with ideas is. And this is how it is supposed to be. The notes are just the tangible outcome of it. All you have to do is to have a pen in your hand while you are doing what you are doing anyway (or a keyboard under your fingers). Writing notes *accompanies* the main work and, done right, it helps with it. Writing is, without dispute, the best facilitator for thinking, reading, learning, understanding and generating ideas we have. Notes build up *while* you think, read, understand and generate ideas, because you have to have a pen in your hand if you want to think, read, understand and generate ideas properly anyway. If you want to learn something for the long run, you have to write it down. If you want to really understand something, you have to translate it into your own words. Thinking takes place as much on paper as in your own head. "Notes on paper, or on a computer screen [...] do not make contemporary physics or other kinds of intellectual endeavour easier, they make it possible," neuroscientist Neil Levy concludes in the introduction to the *Oxford Handbook of Neuroethics*, summarizing decades of research. Neuroscientists, psychologists and other experts on thinking have very different ideas about how our brains work, but, as Levy writes: "no matter

how internal processes are implemented, (you) need to understand the extent to which the mind is reliant upon external scaffolding." (2011, 270) If there is one thing the experts agree on, then it is this: You have to externalise your ideas, you have to write. Richard Feynman stresses it as much as Benjamin Franklin. If we write, it is more likely that we understand what we read, remember what we learn and that our thoughts make sense. And if we have to write anyway, why not use our writing to build up the resources for our future publications?

Thinking, reading, learning, understanding and generating ideas is the main work of everyone who studies, does research or writes. If you write to improve all of these activities, you have a strong tailwind going for you. If you take your notes in a smart way, it will propel you forward.

2.1 Writing a paper step by step

1. Make fleeting notes. Always have something at hand to write with to capture every idea that pops into your mind. Don't worry too much about how you write it down or what you write it on. These are fleeting notes, mere reminders of what is in your head. They should not cause any distraction. Put them into one place, which you define as your inbox, and process them later. I usually have a simple notebook with me, but I am happy with napkins or receipts if nothing else is at hand. Sometimes I leave a voice record on my phone. If your thoughts are already sorted and you have the time, you can skip this step and write your idea directly down as a proper, permanent note for your slip-box.

2. Make literature notes. Whenever you read something, make notes about the content. Write down what you don't want to forget or think you might use in your own thinking or writing. Keep it very short, be extremely selective, and use your own words. Be extra selective with quotes – don't copy them to skip the step of really understanding what they mean. Keep these notes together with the bibliographic details in one place – your reference system.

3. Make permanent notes. Now turn to your slip-box. Go through the notes you made in step one or two (ideally once a day and before you forget what you meant) and think about how they relate to what is relevant for your own research, thinking or interests. This can soon be done by looking into the slip-box – it only contains what interests you anyway. The idea is not to collect,

but to develop ideas, arguments and discussions. Does the new information contradict, correct, support or add to what you already have (in the slip-box or on your mind)? Can you combine ideas to generate something new? What questions are triggered by them?
Write exactly one note for each idea and write as if you were writing for someone else: Use full sentences, disclose your sources, make references and try to be as precise, clear and brief as possible. Throw away the fleeting notes from step one and put the literature notes from step two into your reference system. You can forget about them now. All that matters is going into the slip-box.

4. Now add your new permanent notes to the slip-box by:

a) Filing each one behind one or more related notes (with a program, you can put one note "behind" multiple notes; if you use pen and paper like Luhmann, you have to decide where it fits best and add manual links to the other notes). Look to which note the new one directly relates or, if it does not relate directly to any other note yet, just file it behind the last one.

b) Adding links to related notes.

c) Making sure you will be able to find this note later by either linking to it from your index or by making a link to it on a note that you use as an entry point to a discussion or topic and is itself linked to the index.

5. Develop your topics, questions and research projects bottom up from within the system. See what is there, what is missing and what questions arise. Read more to challenge and strengthen your arguments and change and develop your arguments according to the new information you are learning about. Take more notes, develop ideas further and see where things will take you. Just follow your interest and always take the path that promises the most insight. Build upon what you have. Even if you don't have anything in your slip-box yet, you never start from scratch – you already have ideas on your mind to be tested, opinions to be challenged and questions to be answered. Do not brainstorm for a topic. *Look* into the slip-box instead to see where chains of notes have developed and ideas have been built up to clusters. Don't cling to an idea if another, more promising one gains momentum. The more you become interested in something, the more you will read and think

about it, the more notes you will collect and the more likely it is that you will generate questions from it. It might be exactly what you were interested in from the beginning, but it is more likely that your interests will have changed – that is what insight does.

6. After a while, you will have developed ideas far enough to decide on a topic to write about. Your topic is now based on what you *have*, not based on an unfounded idea about what the literature you are about to read might provide. Look through the connections and collect all the relevant notes on this topic (most of the relevant notes will already be in partial order), copy them onto your "desktop"[6] and bring them in order. Look for what is missing and what is redundant. Don't wait until you have everything together. Rather, try ideas out and give yourself enough time to go back to reading and note-taking to improve your ideas, arguments and their structure.

7. Turn your notes into a rough draft. Don't simply copy your notes into a manuscript. *Translate* them into something coherent and embed them into the context of your argument while you build your argument out of the notes at the same time. Detect holes in your argument, fill them or change your argument.

8. Edit and proofread your manuscript. Give yourself a pat on the shoulder and turn to the next manuscript.

These are the steps, presented as if you will write only one paper/article at a time. In reality, you never work on just one idea, but many ideas in different stages at the same time. And that is where the system plays out its real strengths. We cannot help but think about more than one question at a time and the chances are that you will think and write in the future as well. It might not be for academia or a publication, but certainly for your own intellectual growth. Gather what you encounter along your way and don't let any good idea go to waste. You might read a certain book in hope it could be useful for one of the papers you write. Maybe you are wrong, but it still might contain some interesting thoughts worth keeping and useful for something else you haven't thought about yet.

In truth, it is highly unlikely that every text you read will contain exactly the information you looked for and nothing else. Otherwise, you must have already known what was in there and wouldn't have had reason to read it in

the first place.[7] As the only way to find out if something is worth reading is by reading it (even just bits of it), it makes sense to use the time spent in the best possible way. We constantly encounter interesting ideas along the way and only a fraction of them are useful for the particular paper we started reading it for. Why let them go to waste? Make a note and add it to your slip-box. It improves it. Every idea adds to what can become a critical mass that turns a mere collection of ideas into an idea-generator.

A typical work day will contain many, if not all, of these steps: You read and take notes. You build connections within the slip-box, which in itself will spark new ideas. You write them down and add them to the discussion. You write on your paper, notice a hole in the argument and have another look in the file system for the missing link. You follow up on a footnote, go back to research and might add a fitting quote to one of your papers in the making.

How focused you want to read depends on your priorities. You don't have to read anything you don't consider an absolute necessity for finishing your most urgent paper, but you will still encounter a lot of other ideas and information along the way. Spending the little extra time to add them to your system will make all the difference, because the accidental encounters make up the majority of what we learn.

Imagine if we went through life learning only what we planned to learn or being explicitly taught. I doubt we would have even learned to speak. Each added bit of information, filtered only by our interest, is a contribution to our future understanding, thinking and writing. And the best ideas are usually the ones we haven't anticipated anyway.

Most people follow different lines of thought at the same time. They might focus for a while on one idea, but then leave it alone for another while until they see how to proceed further. It is helpful then to be able to pick up on another idea now and go back to the earlier thought later. It is much more realistic to keep this flexibility and you don't have to worry about starting all over.

3 Everything You Need to Have

There is this story where NASA tried to figure out how to make a ballpoint pen that works in space. If you have ever tried to use a ballpoint pen over your head, you have probably realised it is gravity that keeps the ink flowing. After a series of prototypes, several test runs and tons of money invested, NASA developed a fully functional gravity-independent pen, which pushes the ink onto the paper by means of compressed nitrogen. According to this story, the Russians faced the same problem. So they used pencils (De Bono, 1998, 141). The slip-box follows the Russian model: Focus on the essentials, don't complicate things unnecessarily.

Academic writing in itself is not a complicated process that requires a variety of complicated tools, but is in constant danger of being clogged with unnecessary distractions. Unfortunately, most students collect and embrace over time a variety of learning and note-taking techniques, each promising to make something easier, but combined have the opposite effect.

The whole workflow becomes complicated: There is the technique of underlining important sentences (sometimes in different colours or shapes), commenting in the margins of a text, writing excerpts, employing reading methods with acronyms like SQ3R[8] or SQ4R,[9] writing a journal, brainstorming a topic or following multi-step question sheets – and then there are, of course, the one thousand and twelve apps and programs that are supposed to help with learning and writing. Few of these techniques are particularly complicated in themselves, but they are usually used without any regard to the actual workflow, which then quickly becomes a mess. As nothing really fits together, working *within* this arrangement becomes extremely complicated indeed and difficult to get anything done.

And if you stumble upon one idea and think that it might connect to another idea, what do you do when you employ all these different techniques? Go through all your books to find the right underlined sentence? Reread all your journals and excerpts? And what do you do then? Write an excerpt about it? Where do you save it and how does this help to make new connections? Every little step suddenly turns into its own project without bringing the whole much further forward. Adding another promising technique to it, then, would make things only worse.

That is why the slip-box is not introduced as another technique, but as a crucial element in an overarching workflow that is stripped of everything that could distract from what is important. Good tools do not add features and more options to what we already have, but help to reduce distractions from the main work, which here is *thinking*. The slip-box provides an external scaffold to think in and helps with those tasks our brains are not very good at, most of all objective storage of information.

That is pretty much it. To have an undistracted brain to think with and a reliable collection of notes to think in is pretty much all we need. Everything else is just clutter.

3.1 The Tool Box

We need four tools:

- Something to write with and something to write on (pen and paper will do)
- A reference management system (the best programs are free)
- The slip-box (the best program is free)
- An editor (whatever works best for you: very good ones are free)

More is unnecessary, less is impossible.

1. You need something to capture ideas whenever and wherever they pop into your head. Whatever you use, it should not require any thoughts, attention or multiple steps to write it down. It can be a notebook, a napkin, an app on your phone or iPad. These notes are not meant to be stored permanently. They will be deleted or chucked soon anyway. They only function as a reminder of a thought and are not meant to capture the thought itself, which requires time to phrase proper sentences and check facts. I recommend having pen and paper with you at all times. It is really hard to beat a notebook in its simplicity. If you use other tools, make sure everything ends up in one place, a central inbox or something like that, where you can process it soon, ideally within a day.
2. The reference system has two purposes: To collect the references (duh) and the notes you take during your reading. I strongly recommend using a free program like Zotero, which allows you to make new entries via

browser plugins or just by entering the ISBN or digital object identifier (DOI) number. Zotero also can be integrated into Microsoft Word, OpenOffice, LibreOffice and NeoOffice, which allows you to insert quotations without actually typing in the reference. That not only makes things easier, you also mitigate the risk of messing things up when you add, edit or delete additional references. You can also easily change the format according to the standards required by your professors or the journal you write for. You can add notes to each entry – but it would also be fine to write your notes by hand and link them to the reference if you prefer to write by hand at this stage. In that case, just give the notes a standardised title like "AuthorYear" and keep them in alphabetical order in one place. You can download Zotero for free at zotero.org (Windows, Mac and Linux). You will find the links to all recommended programs on takesmartnotes.com.[10] If you prefer or already work with another, equally simple program, there is no reason not to use that.

3. The slip-box. Some prefer the old-fashioned pen and paper version in a wooden box. That's fine – computers can only speed up a relatively minor part of the work anyway, like adding links and formatting references. They can't speed up the main part of the work, which is thinking, reading and understanding. All you would need are sheets of paper about the size of a postcard (Luhmann used the DIN A6 size, 148 x 105 mm or 5.83 x 4.13 inches) and a box to keep them in. And even though there are clear benefits of handwriting (cf. below chapter 3.2.1), I recommend using the digital version, if only for mobility. Even though you could basically emulate the slip-box with any program that allows setting links and tagging (like Evernote or a Wiki), I strongly recommend using Daniel Lüdecke's Zettelkasten. It is the only program I know that really implements the principles behind Luhmann's system and is at the same time simple and easy to use. It is free and available for different operating systems. You can download it from zettelkasten.danielluedecke.de (please consider sending a donation to the developer if you like it).

4. Finally, the editor: If you use Zotero, I recommend using one of the editors it is compatible with (Microsoft Word, OpenOffice, LibreOffice or NeoOffice), because it makes life a lot easier if you don't have to type in every reference manually. Except for that, everything works fine – no

editor can improve an argument.

If you have pen and paper, an editor, your slip-box and reference system at hand, you are ready to go.

4 A Few Things to Keep in Mind

Getting the tools ready shouldn't have taken more than 5-10 minutes. But having the right tools is only one part of the equation. It is easy to get fooled by their simplicity. Many "tried them out" without really understanding how to work with them and were expectedly disappointed with the results. Tools are only as good as your ability to work with them. Everybody knows how to handle a flute (you blow into one end and press your fingers on the holes according to the notes you are playing), but nobody would try it out once and then judge the instrument on what they hear.[11]

But with tools like the slip-box, we sometimes forget that the handling is as important as the possibilities of the tool itself. If we try to use a tool without putting any thought into the way we work with it, even the best tool would not be of much help. The slip-box, for example, would most likely be used as an archive for notes – or worse: a graveyard for thoughts (cf. Hollier 2005, 40 on Mallarmé's index cards). Unfortunately, there are quite a few explanations of Luhmann's technique on the Internet that focus in a misleading way on the technicalities of the slip-box. This has led to plenty of misconceptions about its abilities. But things are changing: Luhmann's slip-box is currently the object of a long-term research project at the University of Bielefeld, and their first results have already given us a comprehensive understanding about how Luhmann really worked with it. You can look up for yourself some of his notes on their website.[12] Soon, you will be able to access the whole digitalised slip-box online. Add to this understanding recent psychological insights about learning, creativity and thinking, and we also get a pretty good picture *why* it works. And it is indeed crucially important not only to know how it works or how to work with it, but also why it works. Only then will you be able to tweak it for your own needs. And this is what this book is for: To give you all the resources you need to work in the best possible way with the best technique available. By keeping just a few basic principles in mind and with an understanding of the logic behind the file system, I see no reason why anyone should not be able to replicate Luhmann's formula for successful learning, writing and research.

THE FOUR UNDERLYING PRINCIPLES

5 Writing Is the Only Thing That Matters

For students, the need for writing mainly appears in the form of examination. In this understanding, the written work *represents* a preceded performance, namely learning, understanding and the ability to analyse other texts critically. By writing, students *demonstrate* what they have learned, show their ability to think critically and ability to develop ideas. This understanding is related to the idea that students *prepare* for independent research. In this mindset, the writing of a paper is just another skill to be learned. It is compartmentalised from the other tasks – it is seen as one task among others. Students should not only learn to write papers, but also learn facts, be able to discuss their ideas in seminars and listen carefully to lectures. Writing papers is seen as a task in itself with a beginning and an end. Almost all books written on academic writing start from this assumption. And almost all of them proceed accordingly, describing an idealised process in certain consecutive steps.

First, the task to write is given, then there is the challenge to find a topic or a specific angle on a problem, the research to do, starting with the collection of the relevant literature, followed by reading the material, processing it and coming to a conclusion. Writing is what follows: In the beginning stands the question to be answered, followed by an overview of the literature, the discussion of it and the conclusion. This, according to this thinking, prepares you for doing independent research. Alas, it does not. If you become successful in your research, it was not because you learned to approach writing in this way, but *despite* it.

This book is based on another assumption: Studying does not prepare students for independent research. It *is* independent research. Nobody starts from scratch and everybody is already able to think for themselves. Studying, done properly, is research, because it is about gaining insight that cannot be anticipated and will be shared within the scientific community under public scrutiny. There is no such thing as private knowledge in academia. An idea kept private is as good as one you never had. And a fact no one can reproduce is no fact at all. Making something public always means to write it down so it can be read. There is no such thing as a history of unwritten ideas.

School is different. Pupils are usually not encouraged to follow their own learning paths, question and discuss everything the teacher is teaching and move on to another topic if something does not promise to generate interesting insight. The teacher is there for the pupils to learn. But, as Wilhelm von Humboldt, founder of the Humboldt University of Berlin and brother to the great explorer Alexander von Humboldt, put it, the professor is not there for the student and the student not for the professor. Both are only there for the truth. And truth is *always* a public matter. Everything within the university aims at some kind of publication. A written piece does not necessarily need to be accepted in an international journal to become public. In fact, the vast majority of what is written and discussed is not published in this narrow sense. The review process itself is a form of presenting an idea publicly to the peers and so is everything a student hands over to a professor or lecturer. Even the handout for a presentation discussed with fellow students is a written piece made public. It is public because in the discussion, it does not matter anymore what the author *meant*, only what is there in writing. The moment the author can be removed from the scene, the written piece is a public claim on truth. The criteria for a convincing argument are always the same, regardless of who the author is or the status of the publisher: They have to be coherent and based on facts. Truth does not belong to anyone; it is the outcome of the scientific exchange of written ideas. This is why the presentation and the production of knowledge cannot be separated, but are rather two sides of the same coin (Peters and Schäfer 2006, 9). If writing is the medium of research and studying nothing else than research, then there is no reason not to work as if nothing else counts than writing.

Working as if nothing else counts than writing does not mean spending more time writing at the expense of everything else. Only if we compartmentalise our work into different, isolated tasks will it seem like focusing on writing reduces the time we spend on other tasks. But it does not mean to read less, for this is the main source of the writing material. It doesn’t mean to attend fewer lectures or seminars, because they provide you with the ideas to write about and questions worth answering. Attending lectures is also one of the best ways to get an idea about the current state of research, not to mention the ability to ask and discuss questions. Focusing on writing also doesn’t mean to stop giving presentations or finding other ways

of making your thoughts public. Where else could you get feedback for your ideas?

Focusing on writing as if nothing else counts does not necessarily mean you should do everything else less well, but it certainly makes you do everything else *differently*. Having a clear, tangible purpose when you attend a lecture, discussion or seminar will make you more engaged and sharpen your focus. You will not waste your time with the attempt to figure out what you "should" learn. Rather, you will try to learn as efficiently as possible so you can quickly get to the point where actual open questions arise, as these are the only questions worth writing about. You quickly learn to distinguish good-sounding arguments from actual good ones, as you will have to think them through whenever you try to write them down and connect them with your previous knowledge. It will change the way you read as well: You will become more focused on the most relevant aspects, knowing that you cannot write down everything. You will read in a more engaged way, because you cannot rephrase anything in your own words if you don't understand what it is about. By doing this, you will elaborate on the meaning, which will make it much more likely that you will remember it. You also have to think beyond the things you read, because you need to turn it into something new. And by doing everything with the clear purpose of writing about it, you will do what you do *deliberately*. Deliberate practice is the only serious way of becoming better at what we are doing (cf. Anders Ericsson, 2008). If you change your mind about the importance of writing, you will also change your mind about everything else. Even if you decide never to write a single line of a manuscript, you will improve your reading, thinking and other intellectual skills just by doing everything *as if nothing counts other than writing*.

6 Simplicity Is Paramount

We tend to think that big transformations have to start with an equally big idea. But more often than not, it is the simplicity of an idea that makes it so powerful (and often overlooked in the beginning). Boxes, for example, are simple. Malcom McLean, the owner of a trucking company and a former trucker himself, regularly got stuck in traffic on the crowded coastal highways. When he came up with an idea to circumvent the congested roads, it was a simple one. He had no clue that it would tip the world in a new direction. He did not foresee that his simple idea would reshape the political landscape, let some nations rise to the top and other fall behind, make century-old professions redundant, give birth to new industries, and would barely leave a single person on earth unaffected by it. I am speaking, of course, of the shipping container, which is basically just a box. When McLean converted the tanker Ideal X to be able to carry 58 containers and set it to sail on 26 April 1956, it was just because it made more sense to ship parts of a lorry than the whole lorry itself, which in itself made more sense than to have them stand in traffic for days. He certainly did not aim to turn world trade upside down and pave the way for Asia to become the next big economic power. He just didn't want to get stuck in traffic anymore.

It wasn't just that nobody foresaw the impact of something as simple as this box. Most ship owners had in fact considered the idea of putting different kinds of products into the same sized boxes as fairly abstruse. Experienced stevedores were able to use the storage room on a ship optimally by arranging and fitting the goods, and every good came in its optimal package. Why replace it with an obviously less optimal solution? And speaking of suboptimal, why would anyone want to try to fit square boxes into a round-shaped ship body anyway? Ship owners also didn't have many customers who wanted to ship exactly the amount that fit into a container. That either left customers unhappy or containers half empty or filled with goods from different customers, which meant that you had to unpack and rearrange the containers to untangle different orders in every single harbour. That did not sound very efficient to the ears of experienced shippers. And then you had the problem with the boxes themselves. Once unloaded and sent off on

trucks, you had to find a way to get them back. McLean lost hundreds of containers this way. It was a logistical nightmare.

And by the way: McLean wasn't the only one who had the idea to use containers on ships. Many others tried it, too, and almost all gave up on the idea soon after – not because they were too stubborn to accept a great idea, but because they lost too much money on it (Levinson, 2006, 45f). The idea was simple, but it wasn't easy to put it efficiently into practice.

In hindsight, we know why they failed: The ship owners tried to integrate the container into their usual way of working without changing the infrastructure and their routines. They tried to benefit from the obvious simplicity of loading containers onto ships without letting go of what they were used to. In the beginning, the perception was very much shaped by what worked before, and only the most immediate effects were visible. The ship owners looked at the bags and crates of goods and wondered why they should pack them a second time into another box. They were glad when they unloaded their goods at the harbour and they were eager to move on. They wondered why they should go container-hunting instead. They looked at the ships they had and wondered how to fit containers into them. McLean understood better than others that it is not the perspective of the ship-owners that counts, but the purpose of the whole trade: to bring goods from the producer to the final destination. Only after aligning every single part of the delivery chain, from packaging to delivery, from the design of the ships to the design of the harbours, was the full potential of the container unleashed.

When the advantages became obvious, second-order effects came into play and went into a self-reinforcing positive feedback loop. The more harbours were able to handle containers, the more container ships were needed to be built, which made shipping cheaper, which increased the range of goods worth shipping, which created more traffic, which made bigger container ships economical, which created more demand for infrastructure and so on. It wasn't just another way of shipping goods. It was a whole new way of doing business.

Many students and academic writers think like the early ship owners when it comes to note-taking. They handle their ideas and findings in the way it makes immediate sense: If they read an interesting sentence, they underline it. If they have a comment to make, they write it into the margins. If they have an idea, they write it into their notebook, and if an article seems

important enough, they make the effort and write an excerpt. Working like this will leave you with a lot of different notes in many different places. Writing, then, means to rely heavily on your brain to remember where and when these notes were written down. A text must then be conceptualised independently from these notes, which explains why so many resort to *brainstorming* to arrange the resources afterwards according to this preconceived idea. In this textual infrastructure, this so-often-taught workflow, it indeed does not make much sense to rewrite these notes and put them into a box, only to take them out again later when a certain quote or reference is needed during writing and thinking.

In the old system, the question is: Under which topic do I store this note? In the new system, the question is: In which context will I want to stumble upon it again? Most students sort their material by topic or even by seminars and semester. From the perspective of someone who writes, that makes as much sense as sorting your errands by purchase date and the store they were bought from. Can't find your trousers? Maybe they are with the bleach you bought the same day at your department store.

The slip-box is the shipping container of the academic world. Instead of having different storage for different ideas, everything goes into the same slip-box and is standardised into the same format. Instead of focusing on the in-between steps and trying to make a science out of underlining systems, reading techniques or excerpt writing, everything is streamlined towards one thing only: insight that can be published. The biggest advantage compared to a top-down storage system organised by topics is that the slip-box becomes more and more valuable the more it grows, instead of getting messy and confusing. If you sort by topic, you are faced with the dilemma of either adding more and more notes to one topic, which makes them increasingly hard to find, or adding more and more topics and subtopics to it, which only shifts the mess to another level. The first system is designed to find things you deliberately search for, putting all the responsibility on your brain. The slip-box is designed to present you with ideas you have already forgotten, allowing your brain to focus on thinking instead of remembering.

Even though the slip-box, being organised bottom-up, does not face the trade-off problem between too many or too few topics, it too can lose its value when notes are added to it indiscriminately. It can only play out its strengths when we aim for a *critical mass*, which depends not only on the

number of notes, but also their quality and the way they are handled.

To achieve a critical mass, it is crucial to distinguish clearly between three types of notes:

1. *Fleeting notes*, which are only reminders of information, can be written in any kind of way and will end up in the trash within a day or two.
2. *Permanent notes*, which will *never* be thrown away and contain the necessary information in themselves in a permanently understandable way. They are always stored in the same way in the same place, either in the reference system or, written as if for print, in the slip-box.
3. *Project notes*, which are only relevant to one particular project. They are kept within a project-specific folder and can be discarded or archived after the project is finished.

Only if the notes of these three categories are kept separated it will be possible to build a *critical* mass of ideas within the slip-box. One of the major reasons for not getting much writing or publishing done lies in the confusion of these categories.

A typical mistake is made by many diligent students who are adhering to the advice to keep a scientific journal. A friend of mine does not let any idea, interesting finding or quote he stumbles upon dwindle away and writes everything down. He always carries a notebook with him and often makes a few quick notes during a conversation. The advantage is obvious: No idea ever gets lost. The disadvantages are serious, though: As he treats every note as if it belongs to the “permanent” category, the notes will never build up a critical mass. The collection of good ideas is diluted to insignificance by all the other notes, which are only relevant for a specific project or actually not that good on second sight. On top of that, the strict chronological order does not offer any help to find, combine or rearrange ideas in a productive sense. It is not surprising that my friend has a bookshelf filled with notebooks full of wonderful ideas, but not a single publication to show.

The second typical mistake is to collect notes only related to specific projects. On first sight, it makes much more sense. You decide on what you are going to write about and then collect everything that helps you to do that. The disadvantage is that you have to start all over after each project and cut off all other promising lines of thought. That means that everything you

found, thought or encountered during the time of a project will be lost. If you try to mitigate the effect by opening a new folder for every potential new project whenever you stumble upon something that might be interesting for that, you will soon end up with an overwhelming amount of unfinished projects. If that in itself does not become a drag on your motivation, the task of keeping track of them will. But most importantly, without a permanent reservoir of ideas, you will not be able to develop any major ideas over a longer period of time because you are restricting yourself either to the length of a single project or the capacity of your memory. Exceptional ideas need much more than that.

The third typical mistake is, of course, to treat all notes as fleeting ones. You can easily spot this approach by the mess that comes with it, or rather by the cycle of slowly growing piles of material followed by the impulse for major clean-ps. Just collecting unprocessed fleeting notes inevitably leads to chaos. Even small amounts of unclear and unrelated notes lingering around your desk will soon induce the wish of starting from scratch.

What all these category-confusing approaches have in common is that the benefit of note-taking decreases with the number of notes you keep. More notes will make it more difficult to retrieve the right ones and bring related ones together in a playful way. But it should be just the opposite: The more you learn and collect, the more beneficial your notes should become, the more ideas can mingle and give birth to new ones – and the easier it should be to write an intelligent text with less effort.

It is important to reflect on the purpose of these different types of notes. Fleeting notes are there for capturing ideas quickly while you are busy doing something else. When you are in a conversation, listing to a lecture, hear something noteworthy or an idea pops into your mind while you are running errands, a quick note is the best you can do without interrupting what you are in the middle of doing. That might even apply to reading, if you want to focus on a text without interrupting your reading flow. Then you might want to just underline sentences or write short comments in the margins. It is important to understand, though, that underlining sentences or writing comments in the margins are also just fleeting notes and do nothing to elaborate on a text. They will very soon become completely useless – unless you do something with them. If you already know that you will not go back to them, don’t take these kind of notes in the first place. Take proper notes instead. Fleeting notes

are only useful if you review them within a day or so and turn them into proper notes you can use later. Fleeting literature notes can make sense if you need an extra step to understand or grasp an idea, but they will not help you in the later stages of the writing process, as no underlined sentence will ever present itself when you need it in the development of an argument. These kinds of notes are just reminders of a thought, which you haven't had the time to elaborate on yet. Permanent notes, on the other hand, are written in a way that can still be understood even when you have forgotten the context they are taken from.

Most ideas will not stand the test of time, while others might become the seed for a major project. Unfortunately, they are not easy to distinguish right away. That is why the threshold to write an idea down has to be as low as possible, but it is equally crucial to elaborate on them within a day or two. A good indication that a note has been left unprocessed too long is when you no longer understand what you meant or it appears banal. In the first case, you forgot what it was supposed to remind you of. In the second case, you forgot the context that gave it its meaning.

The only permanently stored notes are the literature notes in the reference system and the main notes in the slip-box. The former can be very brief as the context is clearly the text they refer to. The latter need be written with more care and details as they need to be self-explanatory. Luhmann never underlined sentences in the text he read or wrote comments in the margins. All he did was take brief notes about the ideas that caught his attention in a text on a separate piece of paper: "I make a note with the bibliographic details. On the backside I would write 'on page x is this, on page y is that,' and then it goes into the bibliographic slip-box where I collect everything I read." (Hagen, 1997)[13] But before he stored them away, he would read what he noted down during the day, think about its relevance for his own lines of thought and write about it, filling his main slip-box with permanent notes. Nothing in this box would ever get thrown away. Some notes might disappear into the background and never catch his attention again, while others might become connection points to various lines of reasoning and reappear on a regular basis in various contexts.

As it is not possible to foresee the development of the slip-box, the fate of the notes is nothing to worry about. In contrast to the fleeting notes, every

permanent note for the slip-box is elaborated enough to have the potential to become part of or inspire a final written piece, but that can not be decided on up front as their relevance depends on future thinking and developments. The notes are no longer reminders of thoughts or ideas, but contain the actual thought or idea in written form. This is a crucial difference.

It is the standardised format that enables the notes to build up a critical mass in one place. It is also the key to facilitating the thinking and writing process by removing all unnecessary complications or decisions that come with a variety of different formats and storage places. Only because every note is in the same format at the same place can they later be combined and assembled into something new and no thought is ever wasted on the question of where to put or label it.

The last type of note, the ones that are related to only one specific project, are kept together with other project-related notes in a project-specific folder. It doesn't matter in which format these notes are as they are going to end up in the bin after the project is finished anyway (or in an archive – the bin for the indecisive).

Project-related notes can be:

- comments in the manuscript
- collections of project-related literature
- outlines
- snippets of drafts
- reminders
- to-do lists
- and of course the draft itself.

The Zettelkasten has the built-in function of project-specific desktops. Here, you can not only structure your thoughts and conceptualise the chapters of your draft, but also collect and sort the notes for this specific project without fear that they will water down or interfere with the slip-box itself. You can even change the notes according to your project without affecting the notes in the slip-box.

The same applies to the reference system. In Zotero, you can collect

literature in project-specific folders without taking them out of the reference system itself. All this keeps the permanent notes from the project-related notes clearly separated and allows you to experiment and tinker with them as much as you like within the boundaries of each project without interfering with the actual slip-box. I suggest keeping a physical binder for each project to keep all the handwritten notes and printouts separate from the rest and combined in one place.

When you close the folder for your current project in the evening and nothing is left on your desk other than pen and paper, you know that you have achieved a clear separation between fleeting, permanent and project-related notes.

7 Nobody Ever Starts From Scratch

> "The white sheet of paper – or today: the blank screen – is a fundamental misunderstanding" (Nassehi 2015, 185)

The process of writing is vastly misunderstood. If you grab off the shelf a random study guide or self-help book on writing and skim through the first pages, the chances are that you will encounter something like this: "To make your research more efficient, your first step should be to narrow the aspect you choose to focus on and also formulate an explicit question that your research and analysis will address."[14] Almost always, the decision on the topic is presented as the necessary first step, after which follows everything else, like in this guide: "When you have chosen a topic that is right for you, having taken into consideration your personal interests and any necessary background knowledge that may be needed, assess the availability of sources."[15] Thereafter, you will certainly find a multi-step plan you are supposed to follow: Be it twelve steps, according to the Academic Skills & Learning Centre of the Australian National University, or eight, if you go with the recommendations of the Writing Center of the University of Wisconsin, the rough order is always the same: Make a decision on what to write about, plan your research, do your research, write. Interestingly enough, these road maps usually come with the concession that this is only an idealised plan and that in reality, it rarely works like that. This is certainly true. Writing can't be that linear. The obvious question is: If that is true, why not root the course of action in reality instead?

In order to develop a good question to write about or find the best angle for an assignment, one must already have put some thought into a topic. To be able to decide on a topic, one must already have read quite a bit and certainly not just about one topic. And the decision to read something and not something else is obviously rooted in prior understanding, and that didn't come out of thin air, either. Every intellectual endeavour starts from an already existing preconception, which then can be transformed during further inquires and can serve as a starting point for following endeavours. Basically, that is what Hans-Georg Gadamer called the hermeneutic circle (Gadamer 2004). And even though the hermeneutic circle is regularly taught in university, writing at the same time continues to be taught *as if* we could start

from scratch and move forward in a straight line – as if it were possible to pull a good question out of thin air and wait with the reading until the literature research is done. The seemingly pragmatic and down-to-earth-sounding advice – to decide what to write about before you start writing – is therefore either misleading or banal. It is banal if it means only that you should think before you put words on paper. It is misleading if it means that you could make a sound plan on what to write before you have immersed yourself in the topics at hand, which involves writing. It accompanies everything: We have to read with a pen in hand, develop ideas on paper and build up an ever-growing pool of externalised thoughts. We will not be guided by a blindly made-up plan picked from our unreliable brains, but by our interest, curiosity and intuition, which is formed and informed by the actual work of reading, thinking, discussing, writing and developing ideas – and is something that continuously grows and reflects our knowledge and understanding *externally*.

By focusing on what is interesting and keeping written track of your own intellectual development, topics, questions and arguments will emerge from the material without force. Not only does it means that finding a topic or a research question will become easier, as we don't have to squeeze it out of the few ideas that are on top of our head anymore, every question that emerges out of our slip-box will naturally and handily come with material to work with. If we look into our slip-box to see where clusters have built up, we not only see *possible* topics, but topics we have already worked on – even if we were not able to see it up front. The idea that nobody ever starts from scratch suddenly becomes very concrete. If we take it seriously and work accordingly, we *literally* never have to start from scratch again.

Of course, those who *believe* that they do start from scratch don't really start from scratch, either, as they too can only draw on what they have learned or encountered before. But as they haven't *acted* on this fact, they can't track ideas back to their origins and have neither supporting material at hand nor their sources in order. As writing has not accompanied their previous work, they have to either start with something completely new (which is risky) or retrace their ideas (which is boring).

As proper note-taking is rarely taught or discussed, it is no wonder that almost every guide on writing recommends to start with *brainstorming*. If you haven't written along the way, the brain is indeed the only place to turn

to. On its own, it is not such a great choice: it is neither objective nor reliable – two quite important aspects in academic or nonfiction writing. The promotion of brainstorming as a starting point is all the more surprising as it is not the origin of most ideas: The things you are supposed to find in your head by brainstorming usually don't have their origins in there. Rather, they come from the outside: through reading, having discussions and listening to others, through all the things that could have been accompanied and often even would have been improved by writing. The advice to think about what to write about before you write comes both too early and too late. Too late, as you already have passed up the chance to build up written resources when you face the white sheet of paper or the blank screen, but also too early, if you try to postpone every serious content-related work until you have made a decision on the topic.

If something comes too early and too late at the same time, it is not possible to fix it by rearranging the order as the fictional linearity is the problem in itself. Taking smart notes is the precondition to break with the linear order. There is one reliable sign if you managed to structure your workflow according to the fact that writing is not a linear process, but a circular one: the problem of finding a topic is replaced by the problem of having too many topics to write about. Having trouble finding the right topic is a symptom of the wrong attempt to rely heavily on the limitations of the brain, not the inevitable problematic starting point, as most study guides insinuate. If you on the other hand develop your thinking in writing, open questions will become clearly visible and give you an abundance of possible topics to elaborate further in writing.

After many years of working with students, I am convinced that the attempt of these study guides to squeeze a nonlinear process like writing into a linear order is the main reason for the very problems and frustrations they promise to solve. How can you not have trouble finding a topic if you believe you have to decide on one before you have done your research, have read and learned about something? How can you not feel threatened by an empty page if you have literally nothing at hand to fill it with? Who can blame you for procrastinating if you find yourself stuck with a topic you decided on blindly and now have to stick with it as the deadline is approaching? And how can anyone be surprised that students feel overwhelmed with writing assignments when they are not taught how to turn months and years of reading, discussing

and research into material they can really use?

These study guides, which neglect everything before a writing assignment is given, are a little bit like financial advisors who discuss how 65-year-olds can save for retirement. At this point you would be better off curbing your enthusiasm (which is exactly what one of the most often sold study guides in Germany recommends: first, lower your expectations on quality and insight). [16]

But those who have already developed their thinking through writing can keep the focus on what is interesting for them at the moment and accumulate substantial material just by doing what they most feel like doing. The material will cluster around the questions they returned to most often, so they don't risk too far of a departure from their interest. If your first chosen topic turns out to be not as interesting, you will just move on and your notes will cluster around something else. Maybe you will even note down the reasons why the first question is not interesting and turn that into an insight valuable enough to make public. When it finally comes to the decision on what to write about, you will already have made the decision – because you made it on every single step along the way, again and again every day, improving it gradually. Instead of spending your time worrying about finding the right topic, you will spend your time actually working on your already existing interests and doing what is necessary to make *informed* decisions – reading, thinking and writing. By doing the work, you can *trust* that interesting questions will emerge. You might not know where you will end up (and you don't need to), but you can't force insight into a preconceived direction anyway. You minimise both the risk of losing interest in a topic you have once chosen ill-informed and the risk of having to start all over again.

Even though academic writing is not a linear process, that does not mean you should follow an anything-goes approach. On the contrary, a clear, reliable structure is paramount.

8 Let the Work Carry You Forward

You may remember from school the difference between an exergonic and an endergonic reaction. In the first case, you constantly need to add energy to keep the process going. In the second case, the reaction, once triggered, continues by itself and even releases energy. The dynamics of work are not so different. Sometimes we feel like our work is draining our energy and we can only move forward if we put more and more energy into it. But sometimes it is the opposite. Once we get into the workflow, it is as if the work itself gains momentum, pulling us along and sometimes even energizing us. This is the kind of dynamic we are looking for.

A good workflow can easily turn into a virtuous circle, where the positive experience motivates us to take on the next task with ease, which helps us to get better at what we are doing, which in return makes it more likely for us to enjoy the work, and so on. But if we feel constantly stuck in our work, we will become demotivated and much more likely to procrastinate, leaving us with fewer positive or even bad experiences like missed deadlines. We might end up in a vicious circle of failure (cf. Fishbach, Eyal and Finkelstein, 2010).

Any attempts to trick ourselves into work with external rewards (like doing something nice after finishing a chapter) are only short-term solutions with no prospect of establishing a positive feedback loop. These are very fragile motivational constructions. Only if the work itself becomes rewarding can the dynamic of motivation and reward become self-sustainable and propel the whole process forward (DePasque and Tricomi, 2015).

The extraordinary successful fitness motivation coach Michelle Segar uses this dynamic to turn even the most stubborn coach potatoes into exercise aficionados (Segar, 2015). She brings those who really don’t like exercise but know they have to do it into a sustainable workout routine by focusing on one thing: Creating satisfying, repeatable experiences with sports. It doesn’t matter what her clients are doing – running, walking, team sports, gym workouts or bicycling to work. The only thing that matters is that they discover something that gives them a good experience that they would like to have again. Once her clients find *something*, they are encouraged enough to

try something else as well. They enter the virtuous circle where willpower isn't needed anymore because they feel like doing it anyway. If they tried to trick themselves into exercise by rewarding themselves afterwards with a relaxed evening on the sofa watching TV, it wouldn't have taken them long until they went straight for the sofa, skipping the workout altogether, because this is how we tick.

Feedback loops are not only crucial for the dynamics of motivation, but also the key element to any learning process. Nothing motivates us more than the experience of becoming better at what we do. And the only chance to improve in something is getting timely and concrete feedback. Seeking feedback, not avoiding it, is the first virtue of anyone who wants to learn, or in the more general terms of psychologist Carol Dweck, to *grow*. Dweck shows convincingly that the most reliable predictor for long-term success is having a "growth mindset." To actively seek and welcome feedback, be it positive or negative, is one of the most important factors for success (and happiness) in the long run. Conversely, nothing is a bigger hindrance to personal growth than having a "fixed mindset." Those who fear and avoid feedback because it might damage their cherished positive self-image might feel better in the short term, but will quickly fall behind in actual performance (Dweck 2006; 2013). Ironically, it is therefore often the highly gifted and talented students, who receive a lot of praise, who are more in danger of developing a fixed mindset and getting stuck. Having been praised for what they are (talented and gifted) rather than for what they do, they tend to focus on keeping this impression intact, rather than exposing themselves to new challenges and the possibility of learning from failure. Embracing a growth mindset means to get pleasure out of changing for the better (which is mostly inwardly rewarding) instead of getting pleasure in being praised (which is outwardly rewarding). The orientation towards the latter makes one stick to safe, proven areas. The orientation towards the first draws the attention to the areas most in need of improvement. To seek as many opportunities to learn as possible is the most reliable long-term growth strategy. And if growth and success are not reasons enough, then maybe the fact that the fear of failure has the ugliest name of all phobias: Kakorrhaphiophobia.

Having a growth mindset is crucial, but only one side of the equation. Having a learning system in place that enables feedback loops *in a practical way* is equally important. Being open for feedback doesn't help very much if

the only feedback you can get comes once every few months for work you have already finished. The linear model of academic writing comes with very few feedback opportunities, and even those are usually spread out over time (vgl. Fritzsche, Young und Hickson, 2003). If you choose a topic for your paper and work according to the linear model, you will only learn if your choice was wise after multiple stages of research. The same applies to the question of if you understood what you read and if your idea for an argument makes sense.

Following a circular approach, on the other hand, allows you to implement many feedback loops, which give you the chance to improve your work while you are working on it. It is not just about increasing the number of opportunities to learn, but also to be able to correct the mistakes we inevitably make. As the feedback loops are usually smaller than one big chunk of feedback at the end, they are also much less scary and easier to embrace.

Reading with a pen in the hand, for example, forces, us to think about what we read and check upon our understanding. It is the simplest test: We tend to think we understand what we read – until we try to rewrite it in our own words. By doing this, we not only get a better sense of our ability to understand, but also increase our ability to clearly and concisely express our understanding – which in return helps to grasp ideas more quickly. If we try to fool ourselves here and write down incomprehensible words, we will detect it in the next step when we try to turn our literature notes into permanent notes and try to connect them with others.

The ability to express understanding in one's own words is a fundamental competency for everyone who writes – and only by doing it with the chance of realizing our lack of understanding can we become better at it. But the better we become, the easier and quicker we can make notes, which again increases the number of learning experiences. The same applies to the crucial ability to distinguish the important bits of a text from the less important ones: the better we become at it, the more effective our reading will become, the more we can read, the more we will learn. We will enter a beautiful, virtuous circle of competency. You cannot help but feel motivated by it.

The same goes for writing permanent notes, which have another feedback loop built-in: Expressing our own thoughts in writing makes us realise if we really thought them through. The moment we try to combine them with

previously written notes, the system will unambiguously show us contradictions, inconsistencies and repetitions. While these built-in feedback loops do not make redundant the feedback from your peers or supervisor, they are the only ones that are *always* available and can help us to improve a little bit, multiple times every single day. And the best thing about this is that while we learn and become better, our slip-box becomes more knowledgeable too. It grows and improves. And the more it grows, the more useful it becomes and the easier it will be for us to make new connections.

The slip-box is not a collection of notes. Working with it is less about retrieving specific notes and more about being pointed to relevant facts and generating insight by letting ideas mingle. Its usability grows with its size, not just linearly but exponentially. When we turn to the slip-box, its inner connectedness will not just provide us with isolated facts, but with lines of developed thoughts. Moreover, because of its inner complexity, a search thought the slip-box will confront us with related notes we did not look for. This is a very significant difference that becomes more and more relevant over time. The more content it contains, the more connections it can provide, and the easier it becomes to add new entries in a smart way and receive useful suggestions.

Our brains work not that differently in terms of interconnectedness. Psychologists used to think of the brain as a limited storage space that slowly fills up and makes it more difficult to learn late in life. But we know today that the more connected information we already have, the easier it is to learn, because new information can dock to that information. Yes, our ability to learn *isolated* facts is indeed limited and probably decreases with age. But if facts are not kept isolated nor learned in an isolated fashion, but hang together in a network of ideas, or “latticework of mental models” (Munger, 1994), it becomes easier to make sense of new information. That makes it easier not only to learn and remember, but also to retrieve the information later in the moment and context it is needed.

As we are the authors of all the notes, we learn in lockstep with the slip-box. This is another big difference from using an encyclopaedia like Wikipedia. We use the same mental models, theories and terms to organise our thoughts in our brains as in our slip-box. That the slip-box generates an excess of possibilities enables it to surprise and inspire us to generate new ideas and develop our theories further. It is not the slip-box or our brains

alone, but the dynamic between them that makes working with it so productive.

The Six Steps to Successful Writing

9 Separate and Interlocking Tasks

9.1 Give Each Task Your Undivided Attention

According to a widely cited study, the constant interruption of emails and text messages cuts our productivity by about 40% and makes us at least 10 IQ points dumber. Even though this study was never published, makes no claims about intelligence and is statistically irrelevant, it does seem to confirm what most of us believe anyway and that is that we might have an attention deficit problem. It might not show it by content, but the mere fact that it was possible to have a misunderstanding spreading so fast under titles like "E-mails 'hurt IQ more than pot' " (CNN) is telling. There are real studies about that as well. We know for example that watching television reduces the attention span of children (Swing et al. 2010). We also know that the average length of TV soundbites has steadily declined over the last several decades (Fehrmann, 2011). During the U.S. presidential election in 1968, the average soundbite — that is, any footage of a candidate speaking uninterrupted — was still a little more than 40 seconds, but that had fallen to less than 10 seconds at the end of the 80s (Hallin 1994) and 7.8 seconds in 2000 (Lichter, 2001). The last election has certainly not reversed the trend. Whether that means that the media adjust to our decreasing attention span or is causing the trend is not easy to say.[17] But however it might be, it is obvious that we are surrounded by more sources of distraction and less opportunities to train our attention spans.

9.2 Multitasking is not a good idea

If more than one thing tries to catch your attention, the temptation is great to look at more than one thing at the same time – to multitask. Many people claim to be quite good at multitasking. For some, it is one of the most important skills to cope with today's informational overload. It is a common belief that the younger generations are better at it, that it even comes naturally to them as they grew up among the attention-seeking new media. And studies show that those who claim to multitask a lot also claim to be very good at it. Those interviewed in these studies do not see their productivity impaired by it. On the contrary, they think it's improved. But they usually don't test

themselves in comparison with a control group.

Psychologists who interviewed the multitaskers did test them instead of just asking. They gave them different tasks to accomplish and compared their results with another group that was instructed to do only one thing at a time. The outcome is unambiguous: While those who multitasked *felt* more productive, their productivity actually decreased – a lot (Wang and Tchernev 2012; Rosen 2008; Ophir, Nass, and Wagner 2009). Not only the quantity but also the quality of their accomplishments lagged significantly behind that of the control group.

In some areas, like texting and driving, the downsides of multitasking are painfully obvious. But what is most interesting about these studies is not the fact that the productivity and the quality of the work decreases with multitasking, but that it also impairs *the ability to deal with more than one thing at a time*!

This result is surprising, because we usually expect to become better at something the more often we do it. But on a closer look, it makes sense. Multitasking is not what we think it is. It is not focusing attention on more than one thing at a time. Nobody can do that. When we think we multitask, what we really do is shift our attention quickly between two (or more) things. And every shift is a drain on our ability to shift and delays the moment we manage to get focused again. Trying to multitask fatigues us and decreases our ability to deal with more than one task.

The fact that people nevertheless believe that they can get better at it and increase their productivity can easily be explained by two factors. The first is the lack of a control group or an objective external measurement that would provide us with the feedback we need to learn. The second is what psychologists call the mere-exposure effect: doing something many times makes us believe we have become good at it – completely independent of our actual performance (Bornstein 1989). We unfortunately tend to confuse familiarity with skill.

If the only reason to mention this is to recommend you not write your thesis or books while driving, it would be quite banal (still a good idea, though). But it does have practical consequences for the way we work if we think about what “writing” truly means: many different tasks we might end up trying to do at the same time if we don’t separate them consciously and practically.

Writing a paper involves much more than just typing on the keyboard. It also means reading, understanding, reflecting, getting ideas, making connections, distinguishing terms, finding the right words, structuring, organizing, editing, correcting and rewriting. All these are not just different tasks, but tasks requiring a different kind of attention. It is not only impossible to focus on more than one thing at a time, but also to have a *different kind of attention* on more than one thing at a time.

Usually, when we think about attention, we only think about focused attention – something that requires willpower to sustain. This is not too surprising, because this is what most psychologists, philosophers and neuroscientists used to have in mind when they talked about attention (Bruya 2010, 5). Today, research differentiates between multiple forms of attention. Ever since Mihaly Csikszentmihalyi in the 1970s described "flow," the state in which being highly focused becomes effortless (Csikszentmihalyi, 1975), [18] other forms of attention, which are much less dependent on will and effort, attracted researchers' interest.

When it comes to focused attention, we focus on one thing only, something we can sustain for only a few seconds. The maximum duration of focused attention seems not to have changed over time (Doyle and Zakrajsek 2013, 91). Focused attention is different from "sustained attention," which we need to stay focused on one task for a longer period and is necessary to learn, understand or get something done. This is the kind of attention that is most certainly under threat from an increase in distractions. The average duration seems to have shrunken quite considerably over time – we practice much less focused attention than we used to (ibid).

The good news is that we can train ourselves to stay focused on one thing for longer if we avoid multitasking, remove possible distractions and separate different kinds of tasks as much as possible so they will not interfere with each other. This too is not just a question of having the right mindset, but, equally important, of how we organise our workflow. A lack of structure makes it much more challenging to stay focused for extended periods of time. The slip-box provides not only a clear structure to work in, but also forces us to shift our attention consciously as we can complete tasks in reasonable time before moving on to the next one. Together with the fact that every task is accompanied by writing, which in itself requires undistracted attention, the

slip-box can become a haven for our restless minds.

9.3 Give Each Task the Right Kind of Attention

On closer look, it becomes obvious how different the tasks are that are usually summarised under “writing” and how different the kinds of attention are that they require.

Proofreading, for example, is obviously part of the writing process, but requires a very different state of mind than the attempt to find the right words. When we proofread a manuscript, we take on the role of a critic who takes a step back to see the text with the eyes of a dispassionate reader. We scan the text for typos, try to smooth out patches and check structure. We deliberately put distance between ourselves and the text to see what is really on the paper, not just in our heads. We try to block out the knowledge of what we meant to say to be able to see what we wrote.

While taking on the role of a critic is not the same as being an impartial reader, it is enough to spot most of what we missed before: the holes in the argument, the parts we did not explain as we did not need to explain them to ourselves. To be able to switch between the role of critic and the role of writer requires a clear separation between these two tasks, and that becomes easier with experience. If we proofread a manuscript and don’t manage to get enough distance from ourselves as authors, we will only see our thoughts, not the actual text. It is a common issue that comes up during discussions with students: When I point out problems within the argument, an ill-defined term or just an ambiguous passage, students usually refer to what they *mean* first and only shift their focus to what they have written when they fully understand that what they mean is completely irrelevant within the scientific community.

Letting the inner critic interfere with the author isn’t helpful, either. Here we have to focus our attention on our thoughts. If the critic constantly and prematurely interferes whenever a sentence isn’t perfect yet, we would never get anything on paper. We need to get our thoughts on paper first and improve them *there*, where we can look at them. Especially complex ideas are difficult to turn into a linear text in the head alone. If we try to please the critical reader instantly, our workflow would come to a standstill. We tend to call extremely slow writers, who always try to write as if for print, perfectionists. Even though it sounds like praise for extreme professionalism,

it is not: A real professional would wait until it was time for proofreading, so he or she can focus on one thing at a time. While proofreading requires more focused attention, finding the right words during writing requires much more floating attention.

It is also easier to focus on finding the right words if we don't have to think about the structure of the text at the same time, which is why a printed outline of the manuscript should be always in front of our eyes. We have to know what we *don't* have to write about at the moment, because we know that we will take care of that in another part of our text.

Outlining or changing the outline is also a very different task that requires a very different focus on something else: not on one thought, but on the whole argument. It is important, though, to understand outlining not as the preparation of writing or even as planning, but as a separate task we need to return to throughout the writing process on a regular basis. We need a structure all the time, but as we work our way bottom-up, it is bound to change often. And whenever we need to update the structure, we need to take a step back, look at the big picture and change it accordingly.

Proofreading, formulating and outlining are also different from the task of combining and developing thoughts. Working with the slip-box means playing with ideas and looking out for interesting connections and comparisons. It means building clusters, combining them with other clusters and preparing the order of notes for a project. Here, we need to puzzle with notes and find the best fit. It is much more associative, playful and creative than the other tasks and requires a very different kind of attention as well.

Reading, of course, is also different. Reading in itself can require very different kinds of attention, depending on the text. Some texts need to be read slowly and carefully, while others are only worth skimming. It would be ridiculous to adhere to a general formula and read every text in the same way, even though that is what many study guides or speed-reading courses try to convince us of. It is not a sign of professionalism to master one technique and stick to it no matter what, but to be flexible and *adjust* one's reading to whatever speed or approach a text requires.

In short, academic writing requires the whole spectrum of attention. To master the art of writing, we need to be able to apply whatever kind of attention and focus is needed.

Psychologists used to associate scientific work exclusively with focussed

attention, while other, more floating kinds of attention were exclusively associated with creative work like art. We know today that we need both kinds of attention for art and science. It is not surprising, therefore, that this flexibility can be found among most, if not all, exceptional scientists. Oshin Vartanian compared and analysed the daily workflows of Nobel Prize winners and other eminent scientists and concluded that it is not a relentless focus, but flexible focus that distinguishes them. “Specifically, the problem-solving behavior of eminent scientists can alternate between extraordinary levels of focus on specific concepts and playful exploration of ideas. This suggests that successful problem solving may be a function of flexible strategy application in relation to task demands.” (Vartanian 2009, 57)

These studies help to solve a puzzle that has bothered psychologists who study creative people as well. “On one hand, those with wandering, defocused, childlike minds seem to be the most creative; on the other, it seems to be analysis and application that’s important. The answer to this conundrum is that creative people need both … The key to creativity is being able to switch between a wide-open, playful mind and a narrow analytical frame.” (Dean, 2013, 152)

What psychologists do not discuss, though, are the *external* conditions that allow us to be flexible in the first place. The mental flexibility to be extremely focused for one moment and playfully explore ideas in the next is just one side of the equation. To be flexible, we need an equally flexible work structure that doesn’t break down every time we depart from a preconceived plan. One can be the best driver with the quickest reactions, able to adjust flexibly to different street and weather conditions. None of that will help a bit if the driver is stuck on rails. And it does not help us to have great insight into the necessity of being flexible in our work if we are stuck in a rigid organisation.

Unfortunately, the most common way people organise their writing is by making plans. Although planning is almost universally recommended by study guides, it’s the equivalent of putting oneself on rails.

Don’t make plans. Become an expert.

9.4 Become an Expert Instead of a Planner

> “(An) exclusive use of analytical rationality tends to impede further improvement in human performance because of analytical rationality’s slow reasoning and its emphasis on rules,

> principles, and universal solutions. Second, bodily involvement, speed, and an intimate knowledge of concrete cases in the form of good examples is a prerequisite for true expertise." (Flyvbjerg 2001, 15)

The moment we stop making plans is the moment we start to learn. It is a matter of practice to become good at generating insight and write good texts by choosing and moving flexibly between the most important and promising tasks, judged by nothing else than the circumstances of the given situation. It is similar to the moment where we had the training wheels of our bikes taken off and started to learn cycling properly. We might have felt a bit insecure in the first moment, but at the same time, it became obvious that we would never have learned to bicycle if we left the training wheels on. The only thing we would have learned is to ride a bike with training wheels on.

Similarly, no one would ever learn the art of productive academic writing just by following plans or linear, multistep prescripts – one would learn only to follow plans or prescripts. The widespread praise for planning rests on the misconception that a process like writing an academic text, which is highly dependent on cognition and thinking, can rely on conscious decision-making alone. But academic writing is an art, as well, which means it is something we can become better at with experience and deliberate practice.

Experts rely on *embodied* experience, which enables them to reach the state of virtuosity. An expert in academic writing has a feel for the process, an acquired intuition for which task will bring one closer to the finished manuscript and what is only a distraction. There can be no universally applicable rule about which step has to be taken when. Each new project is different, and at each stage of the project, it might be best to read up on something, to review a passage, to discuss an idea or to change the outline of the manuscript. There is no universal rule that could tell one upfront at which stage it wouldn't make sense to follow up on an idea, a possible contradiction or a footnote.

To be able to become an expert, we need the freedom to make our own decisions and all the necessary mistakes that help us learn. Like bicycling, it can only be learned by doing it. Most study guides and academic writing teachers are trying very hard to spare you from that experience by telling you what, when and how to write instead. But they are keeping you from learning the very thing academia and writing is all about: gaining insight and making it public.

And this, by the way, is the reason why you should never ask the teachers of paramedics for help if you find yourself in the admittedly unlikely situation where you can choose the person who should perform CPR on you.

In an experiment, beginner and expert paramedics and their teachers were shown scenes of CPR performed by either experienced paramedics or those who had just finished their training (Flyvbjerg 2001).[19]

As you might expect, the experienced paramedics were able to spot their kind correctly in almost all cases (~90%), while the beginners were more or less just guessing (~50%). So far, so good. But when the teachers watched the videos, they systematically mistook the beginners for experts and the experts for beginners. They were wrong in *most of the cases* (and only right in about a third of all the cases).

Hubert and Stuart Dreyfus, researchers on expertise, have a simple explanation: Teachers tend to mistake the ability to follow (their) rules with the ability to make the right choices in real situations. Unlike the expert paramedics, they did not look at the unique circumstances and check if the paramedics in the videos did the best thing possible in each individual situation. Instead, they focused on the question of whether the people in the videos acted according to the rules they taught.

Because trainees lack the experience to judge a situation correctly and confidently, they need to stick to the rules they were taught, much to the delight of their teachers. According to the Dreyfuses, the correct application of teachable rules enables you to become a competent “performer” (which corresponds to a “3” on their five-grade expert scale), but it won’t make you a “master” (level 4) and certainly won’t turn you into an “expert” (level 5).

Experts, on the other hand, have internalised the necessary knowledge so they don’t have to actively remember rules or think consciously about their choices. They have acquired enough experience in various situations to be able to rely on their *intuition* to know what to do in which kind of situation. Their decisions in complex situations are explicitly not made by long rational-analytical considerations, but rather come from the gut (cf. Gigerenzer, 2008a, 2008b).

Here, gut feeling is not a mysterious force, but an incorporated history of experience. It is the sedimentation of deeply learned practice through numerous feedback loops on success or failure.[20] Even a rational and

analytical endeavour like science does not function without expertise, intuition and experience – which is one of the most interesting outcomes of the empirical research on natural scientists in their laboratories (Rheinberger 1997). Chess players seem to think *less* than beginners. Rather, they *see* patterns and let themselves be guided by their experience from the past rather than attempt to calculate turns far into the future.

But like in professional chess, the intuition of professional academic and nonfiction writing can also only be gained by systematic exposure to feedback loops and experience, which means that success in academic writing depends to a great degree on the *organization of its practical side*. The workflow around the slip-box is not a prescription that tells you what to do at what stage of writing. On the contrary: It gives you a structure of clearly separable tasks, which can be completed within reasonable time and provides you with instant feedback through interconnected writing tasks. It allows you to become better by giving you the opportunity for deliberate practice. The more experience you gain, the more you will be able to rely on your intuition to tell you what to do next. Instead of taking you "from intuition to professional writing strategies", as the title of a typical study guide promises, it is here all about becoming a professional by acquiring the skills and experience to judge situations correctly and intuitively so you can chuck misleading study guides for good. Real experts, Flyvbjerg writes unambiguously, don't make plans (Flyvbjerg 2001, 19).

9.5 Get Closure

Attention is not our only limited resource. Our short-term memory is also limited. We need strategies not to waste its capacity with thoughts we can better delegate to an external system. While the estimations of our long-term memory capacity are wildly diverse and rather speculative, psychologists used to tend to agree on a very specific number when it came to short-term memory: We can hold a maximum of seven things in our head at the same time, plus/minus two (Miller 1956).

Information cannot be saved in short-term memory like on a memory stick. Rather, it kind of floats around in our heads, seeks our attention and occupies valuable mental resources until it is either forgotten, replaced by something

more important (according to our brains) or moved into long-term memory. When we try to remember something, say items on a shopping list, we just keep repeating the items mentally, instead of storing them temporarily in some corner of our brains where we can pick them up later and think about something more interesting in the meantime.

But what about memory artists? It might seem like we can increase the number of things we can remember by employing memo techniques – and not just a bit, but significantly. But what we actually do when we use memo techniques is to bundle items together in a meaningful way and remember the bundles – up to about seven (Levin and Levin, 1990). Or, if recent research is right and the participants in earlier tests have always already bundled things together, then the maximum capacity of our working memory is not seven plus/minus two, but more like a maximum of *four* (Cowan 2001).

Have a look at the following number sequence only once and try to remember it right away: 11 95 82 19 62 31 96 64 19 70 51 97 4.

That's difficult, as it has clearly more than seven digits. But it is quite easy when you realise that these are just five years of the World Cup numbered consecutively. Therefore, you have to remember much less than seven individual items. You only have to remember two – the rule and the starting year.[21]

This is why it is so much easier to remember things we understand than things we don't. It is not that we have to choose to focus either on learning or understanding. It is always about understanding – and if it is only for the sake of learning. Things we understand are *connected*, either through rules, theories, narratives, pure logic, mental models or explanations. And deliberately building these kinds of meaningful connections is what the slip-box is all about.

Every step is accompanied by questions like: How does this fact fit into my idea of …? How can this phenomenon be explained by that theory? Are these two ideas contradictory or do they complement each other? Isn't this argument similar to that one? Haven't I heard this before? And above all: What does x mean for y? These questions not only increase our understanding, but facilitate learning as well. Once we make a meaningful connection to an idea or fact, it is difficult not to remember it when we think about what it is connected with.

While we want to remember some things as long as possible, we don’t want to clog our brains with irrelevant information. And the way we organise everyday information makes a big difference not only for long-term memories, but short-term as well.

Here, we have to thank Soviet psychologist Bluma Zeigarnik for her insight and observational skills. The story goes that she went for lunch with her colleagues and was very impressed by the waiter’s ability to remember correctly who ordered what without the need to write anything down. It is said that she had to go back to the restaurant to get the jacket she left there. Much to her surprise, the waiter she admired just minutes ago for his great memory didn’t even recognise her. Questioned about what seemed to her a contradiction, he explained that all the waiters had no problem remembering the orders and matching them with the guests at the table. But the very second diners left the restaurant, the waiters all forgot them completely and focused on the next group.

Zeigarnik successfully reproduced what is now known as the Zeigarnik effect: Open tasks tend to occupy our short-term memory – until they are done. That is why we get so easily distracted by thoughts of unfinished tasks, regardless of their importance. But thanks to Zeigarnik’s follow-up research, we also know that we don’t actually have to finish tasks to convince our brains to stop thinking about them. All we have to do is to write them down in a way that convinces us that it will be taken care of. That’s right: The brain doesn't distinguish between an actual finished task and one that is postponed by taking a note. By writing something down, we literally get it out of our heads. This is why David Allen’s “Getting things done” system works: The secret to have a “mind like water” is to get *all* the little stuff out of our short-term memory. And as we can’t take care of everything once and for all right now, the only way to do that is to have a reliable external system in place where we can keep all our nagging thoughts about the many things that need to be done and trust that they will not be lost.

And the same is true for the work with the slip-box. To be able to focus on the task at hand, we have to make sure other, unfinished tasks are not lingering in our head and wasting precious mental resources.

The first step is to break down the amorphous task of “writing” into smaller pieces of *different* tasks that can be finished in one go. The second step is to make sure we always write down the outcome of our thinking,

including possible connections to further inquiries. As the outcome of each task is written down and possible connections become visible, it is easy to pick up the work any time where we left it without having to keep it in mind all the time. [22] Possible subsequent tasks are open questions or connections to other notes, which we could elaborate on further or not. It also comes up in explicit reminders like “review this chapter and check for redundancies,” which belong into the project folder. Or the third option is the simple fact that something is still in our in-box waiting to be turned into a permanent note – a quick and not-yet–crossed-out note in our notebook, or literature notes not yet archived in our reference system.

All this enables us to later pick up a task exactly where we stopped without the need to “keep in mind” that there still was something to do. That is one of the main advantages of thinking in writing – everything is externalised anyway.

Conversely, we can use the Zeigarnik effect to our advantage by deliberately keeping unanswered questions in our mind. We can ruminate about them, even when we do something that has nothing to do with work and ideally does not require our full attention. Letting thoughts linger without focusing on them gives our brains the opportunity to deal with problems in a different, often surprisingly productive way. While we have a walk or a shower or clean the house, the brain cannot help but play around with the last unsolved problem it came across. And that is why we so often find the answer to a question in rather casual situations.

By taking into account these little insights into how our brains work, we can make sure that we will not get distracted by thoughts of what we need from the supermarket when we sit at the desk. Rather, we may solve a crucial problem while we run errands.

9.6 Reduce the Number of Decisions

Next to the attention that can only be directed at one thing at a time and the short-term memory that can only hold up to seven things at once, the third limited resource is motivation or willpower. Here, too, the environmental design of our workflow makes all the difference. It shouldn’t come as a surprise anymore that a close cooperation with the slip-box turns out to be far superior to any sophisticated planning.

For the longest time, willpower was seen more as a character trait than a resource. This has changed. Today, willpower is compared to muscles: a limited resource that depletes quickly and needs time to recover. Improvement through training is possible to a certain degree, but takes time and effort. The phenomenon is usually discussed under the term "ego depletion": "We use the term *ego depletion* to refer to a temporary reduction in the self's capacity or willingness to engage in volitional action (including controlling the environment, controlling the self, making choices, and initiating action) caused by prior exercise of volition." (Baumeister et al., 1998, 1253)

One of the most interesting findings of the research on ego depletion is the broad variety of things that can have a depleting effect.

> "Our results suggest that a broad assortment of actions make use of the same resource. Acts of self-control, responsible decision making, and active choice seem to interfere with other such acts that follow soon after. The implication is that some vital resource of the self becomes depleted by such acts of volition. To be sure, we assume that this resource is commonly replenished, although the factors that might hasten or delay the replenishment remain unknown, along with the precise nature of this resource." (Baumeister et al., 1998, 1263f)

Even something seemingly unrelated like being the victim of prejudices can have a significant effect (Inzlicht, McKay, and Aronson, 2006) as "controlling the influence of stereotypes (… may rely on the same…) limited-strength resource on which people draw for self-regulation" (Govorun and Payne 2006, 112).

The smartest way to deal with this kind of limitation is to cheat. Instead of forcing ourselves to do something we don't feel like doing, we need to find a way to make us feel like doing what moves our project further along. Doing the work that need to be done without having to apply too much willpower requires a technique, a ruse.

Even though results of these studies are currently under intense scrutiny and have to be taken with a grain of salt (Carter and McCullough 2014; Engber and Cauterucci 2016; Job, Dweck and Walton 2010), it is safe to argue that a reliable and standardised working environment is less taxing on our attention, concentration and willpower, or, if you like, *ego*. It is well known that decision-making is one of the most tiring and wearying tasks, which is why people like Barack Obama or Bill Gates only wear two suit

colours: dark blue or dark grey. This means they have one less decision to make in the morning, leaving more resources for the decisions that really matter.

In the way we organise our research and writing, we too can significantly reduce the amount of decisions we have to make. While content-related decisions have to be made (on what is more and what is less important in an article, on the connections between notes, the structure of a text, etc.), most organisational decisions can be made up front, once and for all, by deciding on *one* system. By always using the same notebook for making quick notes, always extracting the main ideas from a text in the same way and always turning them into the same kind of permanent notes, which are always dealt with in the same manner, the number of decisions during a work session can be greatly reduced. That leaves us with much more mental energy that we can direct towards more useful tasks, like trying to solve the problems in question.

Being able to finish a task in a timely manner and to pick up the work exactly where we left it has another enjoyable advantage that helps to restore our attention: We can have breaks without fear of losing the thread. Breaks are much more than just opportunities to recover. They are crucial for learning. They allow the brain to process information, move it into long-term memory and prepare it for new information (Doyle and Zakrajsek 2013, 69).[23] If we don't give ourselves a break in between work sessions, be it out of eagerness or fear of forgetting what we were doing, it can have a detrimental effect on our efforts. To have a walk (Ratey, 2008) or even a nap[24] supports learning and thinking.[25]

10 Read for Understanding

> "I would advise you to read with a pen in your hand and enter in a little book short hints of what you feel that is common or that may be useful; for this will be the best method of imprinting such portcullis in your memory."
>
> – Benjamin Franklin[26]

10.1 Read With a Pen in Hand

To get a good paper written, you only have to rewrite a good draft; to get a good draft written, you only have to turn a series of notes into a continuous text. And as a series of notes is just the rearrangement of notes you already have in your slip-box, all you *really* have to do is have a pen in your hand when you read.

If you understand what you read and translate it into the different context of your own thinking, materialised in the slip-box, you cannot help but transform the findings and thoughts of others into something that is new and your own. It works both ways: The series of notes in the slip-box develops into arguments, which are shaped by the theories, ideas and mental models you have in your head. And the theories, ideas and mental models in your head are also shaped by the things you read. They are constantly changing and challenged by the surprising connections with which the slip-box confronts you. The richer the slip-box becomes, the richer your own thinking becomes. The slip-box is an idea generator that develops in lockstep with your own intellectual development. Together, you can turn previously separated or even isolated facts into a critical mass of interconnected ideas.

The step from the slip-box to the final text is pretty straightforward. The content is already meaningful, thought through and in many parts already put into well-connected sequences. The notes only need to be put into a linear order. While the notes themselves are formulated so that they can be understood on their own, they are at the same time embedded in one or more contexts that enrich their meaning. Drawing from the slip-box to develop a draft is more like a dialogue with it than a mechanical act. Therefore, the outcome is never a copy of previous work, but always comes with surprises. There will always be something you couldn't have anticipated. Obviously, the same applies to every single step before. The outcome of reading with a

pen in the hand is not possible to anticipate either, and here, too, the idea is not to copy, but to have a meaningful dialogue with the texts we read.

When we extract ideas from the specific context of a text, we deal with ideas that serve a specific purpose in a particular context, support a specific argument, are part of a theory that isn't ours or written in a language we wouldn't use. This is why we have to translate them into our own language to prepare them to be embedded into new contexts of our own thinking, the different context(s) within the slip-box. Translating means to give the truest possible account of the original work, using different words – it does not mean the freedom to make something fit. As well, the mere copying of quotes almost always changes their meaning by stripping them out of context, even though the words aren't changed. This is a common beginner mistake, which can only lead to a patchwork of ideas, but never a coherent thought.

While the literature notes will be stored within the reference system together with the bibliographic details, separate from the slip-box, but still close to the context of the original text, they are already written with an eye towards the lines of thoughts within the slip-box. Luhmann describes this step as follows: "I always have a slip of paper at hand, on which I note down the ideas of certain pages. On the backside I write down the bibliographic details. After finishing the book I go through my notes and think how these notes might be relevant for already written notes in the slip-box. It means that I always read with an eye towards possible connections in the slip-box." (Luhmann et al., 1987, 150)

How extensive the literature notes should be really depends on the text and what we need it for. It also depends on our ability to be concise, the complexity of the text and how difficult it is to understand. As literature notes are also a tool for understanding and grasping the text, more elaborate notes make sense in more challenging cases, while in easier cases it might be sufficient to just jot down some keywords. Luhmann, certainly being on the outer spectrum of expertise, contented himself with pretty short notes and was still able to turn them into valuable slip-box notes without distorting the meaning of the original texts.[27] It is mainly a matter of having an extensive latticework of mental models or theories in our heads that enable us to identify and describe the main ideas quickly (cf. Rickheit and Sichelschmidt, 1999). Whenever we explore a new, unfamiliar subject, our notes will tend to

be more extensive, but we shouldn't get nervous about it, as this is the deliberate practice of understanding we cannot skip. Sometimes it is necessary to slowly work our way through a difficult text and sometimes it is enough to reduce a whole book to a single sentence. The only thing that matters is that these notes provide the best possible support for the next step, the writing of the actual slip-box notes. And what is most helpful is to reflect on the frame, the theoretical background, methodological approach or perspective of the text we read. That often means to reflect as much on what is *not* mentioned as what is mentioned.

Taking literature notes this way is very different from the way literature notes are taken by most students, which is either not systematic enough or overly systematic. Most often, it is just systematic in the wrong way: By employing often-recommended reading techniques like SQ3R or SQ4R, they treat every text the same, regardless of the content. They do not clearly decide on the format and the organisation of their notes and do not have a plan for what to do with them afterwards. Without a clear purpose for the notes, taking them will feel more like a chore than an important step within a bigger project. Sometimes, long excerpts are written with good intentions, but that is not sustainable. Sometimes the only thing that is done is underlining sentences and making some comments in the margins of a book, which is almost like taking no notes at all. And more often than not, reading is not accompanied by taking notes, which is, in terms of writing, almost as valuable as not having read at all. Here, *everything* is about building up a critical mass of useful notes in the slip-box, which gives us a clear idea of how to read and how to take literature notes.

While the purpose of taking literature notes is as clear as the procedure, you are free to use whatever technique helps the most with understanding what you are reading and getting to useful notes – even if you use ten different colours for underlining and a SQ8R reading technique. But all of this would be just an extra step before you do the only step that really counts, which is to take the permanent note that will add value to the actual slip-box. You need to take some form of literature note that captures your understanding of the text, so you have something in front of your eyes while you are making the slip-box note. But don't turn it into a project in itself. Literature notes are short and meant to help with writing slip-box notes. Everything else either helps to get to this point or is a distraction.

You can type a literature note directly into Zotero, where it will be stored with the bibliographic details. You might want to write them by hand, though. Different independent studies indicate that writing by hand facilitates understanding. In a small but fascinating study, two psychologists tried to find out if it made a difference if students in a lecture took notes by hand or by typing them into their laptops (Mueller and Oppenheimer 2014). They were not able to find any difference in terms of the number of facts the students were able to remember. But in terms of *understanding* the content of the lecture, the students who took their notes by hand came out much, much better. After a week, this difference in understanding was still clearly measurable.

There is no secret to it and the explanation is pretty simple: Handwriting is slower and can't be corrected as quickly as electronic notes. Because students can't write fast enough to keep up with everything that is said in a lecture, they are forced to focus on the gist of what is being said, not the details. But to be able to note down the gist of a lecture, you have to understand it in the first place. So if you are writing by hand, you are *forced to think* about what you hear (or read) – otherwise you wouldn't be able to grasp the underlying principle, the idea, the structure of an argument. Handwriting makes pure copying impossible, but instead facilitates the translation of what is said (or written) into one's own words. The students who typed into their laptops were much quicker, which enabled them to copy the lecture more closely but circumvented actual understanding. They focused on completeness. Verbatim notes can be taken with almost no thinking, as if the words are taking a short cut from the ear to the hand, bypassing the brain.

If you decide to write your notes by hand, just keep them in one place and sort them alphabetically in the usual way: "SurnameYear". Then you can easily match them with the bibliographic details in your reference system. But whether you write them by hand or not, keep in mind that it is all about the essence, the understanding and preparation for the next step – the transferring of ideas into the context of your own lines of thoughts in the slip-box.

10.2 Keep an Open Mind

While selectivity is the key to smart note-taking, it is equally important to be selective in a smart way. Unfortunately, our brains are not very smart in selecting information by default. While we should seek out dis-confirming arguments and facts that challenge our way of thinking, we are naturally drawn to everything that makes us feel good, which is everything that confirms what we already believe we know.

The very moment we decide on a hypothesis, our brains automatically go into search mode, scanning our surroundings for supporting data, which is neither a good way to learn nor research. Worse, we are usually not even aware of this *confirmation bias* (or myside bias[28]) that surreptitiously meddles with our life. Somehow, we just seem to happen to be surrounded by people who all think alike. (Not on purpose, of course. We just spend our time with people we like. And why do we like them? Correct: Because they think like us.) We just seem to happen to read the publications that tend to confirm what we already know. (Not on purpose, of course. We just try to stick with good, intelligent texts. And what makes us think these texts are good and intelligent? Correct: because they make sense to *us*.) We look around and just cut out dis-confirming facts without even noticing what we don't see, very much like the same city can one day be full of happy people and the other day full of miserable ones, depending on our mood.

Confirmation bias is a subtle but major force. As the psychologist Raymond Nickerson puts it: "If one were to attempt to identify a single problematic aspect of human reasoning that deserves attention above all others, the confirmation bias would have to be among the candidates for consideration" (Nickerson 1998, 175).

Even the best scientists and thinkers are not free from it. What sets them apart is the mere fact that they are aware of the problem and do something about it. The classic role model would be Charles Darwin. He forced himself to write down (and therefore elaborate on) the arguments that were the most critical of his theories. "I had [...] during many years followed a golden rule, namely, that whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory than favorable ones. Owing to this habit, very few objections were raised against my views,

which I had not at least noticed and attempted to answer." (Darwin 1958, 123)

This is a good (primarily mental) technique to deal with confirmation bias. But we are looking for ways to implement insight into our psychological limitations in an external system. We want to make the right decisions without too much mental effort – very much like Odysseus, who made it impossible for himself to follow the luring singing of the Sirens by getting himself lashed to the mast of his ship. With a good system, the mere necessities of the workflow will force us to act more virtuously without actually having to become more virtuous. Confirmation bias is tackled here in two steps: First, by turning the whole writing process on its head, and secondly, by changing the incentives from finding confirming facts to an indiscriminate gathering of any relevant information regardless of what argument it will support.

The linear process promoted by most study guides, which insanely starts with the decision on the hypothesis or the topic to write about, is a sure-fire way to let confirmation bias run rampant. First, you basically fix your present understanding, as the outcome instead of using it as the starting point, priming yourself for one-sided perception. Then you artificially create a conflict of interest between getting things done (finding support for your preconceived argument) and generating insight, turning any departure from your preconceived plan into a mutiny against the success of your own project. This is a good rule of thumb: If insight becomes a threat to your academic or writing success, you are doing it wrong.

Developing arguments and ideas bottom-up instead of top-down is the first and most important step to opening ourselves up for insight. We should be able to focus on the most insightful ideas we encounter and welcome the most surprising turns of events without jeopardizing our progress or, even better, because it brings our project forward. We postpone the decision on what to write about specifically and focus on building a critical mass within the slip-box. Instead of having the hypothesis in mind all the time, we want to:

- Confirm that we have separated tasks and focus on understanding the text we read,
- Make sure we have given a true account of its content

- Find the relevance of it and make connections.

Only then do we take a step back to look at what developed, then make a decision on what conclusions are to be drawn from that.

The slip-box forces us to be selective in reading and note-taking, but the only criterion is the question of *whether something adds to a discussion in the slip-box*. The only thing that matters is that it *connects or is open to connections*. Everything can contribute to the development of thoughts within the slip-box: an addition as well as a contradiction, the questioning of a seemingly obvious idea as well as the differentiation of an argument. What we are looking for are facts and information that can add *something* and therefore enrich the slip-box. One of the most important habitual changes when starting to work with the slip-box is moving the attention from the individual project with our preconceived ideas towards the open connections within the slip-box.

After aligning our interests, we can go a step further and prime ourselves for seeking out dis-confirming facts. Collecting only one-sided ideas wouldn't be very enriching. Yes, we have to be selective, but not in terms of pros and cons, but in terms of relevant or irrelevant. And as soon we focus on the content of the slip-box, dis-confirming data becomes suddenly very attractive, because it opens up more possible connections and discussions within the slip-box, while mere confirming data does not. It becomes easier to seek out dis-confirming data with practice and can become quite addictive. The experience of how one piece of information can change the whole perspective on a certain problem is exciting. And the more diverse the content of the slip-box is, the further it can bring our thinking forward – provided we haven't decided on the direction upfront. Contradictions within the slip-box can be discussed on follow-up notes or even in the final paper. It is so much easier to develop an interesting text from a lively discussion with a lot of pros and cons than from a collection of one-sided notes and seemingly fitting quotes. In fact, it is almost impossible to write anything interesting and worth publishing (and therefore motivating) if it is based on nothing else than an idea we were able to come up with up front before elaborating on the problem.

The slip-box is pretty agnostic about the content it is fed. It just prefers *relevant* notes. It is a*fter* reading and collecting relevant data, connecting

thoughts and discussing how they fit together that it is time to draw conclusions and develop a linear structure for the argument.

10.3 Get the Gist

The ability to distinguish relevant from less relevant information is another skill that can only be learned by doing. It is the practice of looking for the gist and distinguishing it from mere supporting details. As we are forced to make this distinction when we read with a pen in our hand and write permanent note after permanent note, it is more than mere practice: it is deliberate practice repeated multiple times a day. Extracting the gist of a text or an idea and giving an account in writing is for academics what daily practice on the piano is for pianists: The more often we do it and the more focused we are, the more virtuous we become.

Patterns that help us navigate texts and discourses are not only theories, concepts or the respective terminology, but also typical mistakes we automatically scan an argument for, general categories we apply, writing styles that indicate a certain school of thought or mental models we learn or develop from different insights and can collect like a great and ever-increasing set of thinking tools. Without these tools and reference points, no professional reading or understanding would be possible. We would read every text in the same way: like a novel. But with the learned ability of spotting patterns, we can enter the circle of virtuosity: Reading becomes easier, we grasp the gist quicker, can read more in less time, and can more easily spot patterns and improve our understanding of them. And along the way, we increase our set of thinking tools, which will not only help with academic work, but with thinking and understanding in general. That is why Berkshire Hathaway vice chairman Charlie Munger describes as worldly-wise someone who has a broad set of these tools and knows how to apply them.

But this dynamic can only start if we *ourselves* deliberately decide to take on the task of reading and being selective about it, relying on nothing other than our own judgement of what is important and what is not. Textbooks or secondary literature in general cannot take this off our hands, and students who solely rely on them have no chance of becoming “worldly wise.” This is not far off from what philosopher Immanuel Kant described in his famous text about the Enlightenment: “Nonage [immaturity] is the inability to use

one's own understanding without another's guidance. This nonage is self-imposed if its cause lies not in lack of understanding but in indecision and lack of courage to use one's own mind without another's guidance. Dare to know! (Sapere aude.) 'Have the courage to use your own understanding,' is therefore the motto of the Enlightenment." (Kant 1784)

I suggest taking this literally. The ability to use one's own understanding is a challenge, not a given. Luhmann stresses the importance of permanent notes in this regard:

> "The problem with reading academic texts seems to be that we need not the short-term memory, but the long-term memory to develop reference points for distinguishing the important things from the less important, the new information from the mere repeated. But it is of course impossible to remember everything. That would be rote learning. To put it differently: One has to read extremely selectively and extract widespread and connected references. One has to be able to follow recurrences. But how to learn it if guidance is impossible? […] Probably the best method is to take notes – not excerpts, but condensed reformulated accounts of a text. Rewriting what was already written almost automatically trains one to shift the attention towards frames, patterns and categories in the observations, or the conditions/assumptions, which enable certain, but not other descriptions. It makes sense to always ask the question: What is not meant, what is excluded if a certain claim is made? If someone speaks of 'human rights:' What distinction is made? A distinction towards 'non-human rights?' 'Human duties?' Is it a cultural comparison or one with some historic people who didn't have the concept of human rights, but lived okay together anyway? Often, the text does not give an answer or a clear answer to this question. But then one has to resort to one's own imagination." (Luhmann 2000, 154f)

The better you become in doing this, the quicker you can jot down notes, which are still helpful. Luhmann's notes are very condensed (Schmidt 2015). With practice comes the ability to find the right words to express something in the best possible way, which means in a simple, but not simplified way. Not only will the readers of your text appreciate your ability to explain something clearly, those you talk to will benefit from this ability as well, as it is not limited to writing. It spills over into speaking and thinking. It is proven that readers regard an author and an audience a speaker as more intelligent the more clear and to the point their expressions are (Oppenheimer 2006).

The ability to spot patterns, to question the frames used and detect the distinctions made by others, is the precondition to thinking critically and looking behind the assertions of a text or a talk. Being able to re-frame questions, assertions and information is even more important than having an extensive knowledge, because without this ability, we wouldn't be able to put our knowledge to use. The good news is that these skills can be learned. But

it requires deliberate practice (Ericsson, Krampe, and Tesch-Römer 1993; Anders Ericsson 2008). Taking smart notes is the deliberate practice of these skills. Mere reading, underlining sentences and hoping to remember the content is not.

10.4 Learn to Read

> "If you can't say it clearly, you don't understand it yourself." (John Searle)

Physicist and Nobel Prize winner Richard Feynman once said that he could only determine whether he understood something if he could give an introductory lecture on it. Reading with a pen in your hand is the small-scale equivalent of a lecture. Permanent notes, too, are directed towards an audience ignorant of the thoughts behind the text and unaware of the original context, only equipped with a general knowledge of the field. The only difference is that the audience here consists of our future selves, which will very soon have reached the same state of ignorance as someone who never had access to what we have written about. Of course, it would be helpful to involve other people at all stages of the writing process, because then we can see in their faces how well we have put something or how convincing our arguments are, but that is rather impractical.

Also, we shouldn't underestimate the advantages of writing. In oral presentations, we easily get away with unfounded claims. We can distract from argumentative gaps with confident gestures or drop a casual "you know what I mean" irrespective of whether *we* know what we meant. In writing, these manoeuvres are a little too obvious. It is easy to check a statement like: "But that is what I said!" The most important advantage of writing is that it helps us to confront ourselves when we do not understand something as well as we would like to believe.

"The principle is that you must not fool yourself, and you are the easiest person to fool," Feynman stressed in a speech to young scientists (Feynman 1985, 342). Reading, especially rereading, can easily fool us into believing we understand a text. Rereading is especially dangerous because of the mere-exposure effect: The moment we become familiar with something, we start believing we also understand it. On top of that, we also tend to like it more (Bornstein 1989).

While it is obvious that familiarity is not understanding, we have no chance

of knowing whether we understand something or just believe we understand something until we test ourselves in some form. If we don't try to verify our understanding during our studies, we will happily enjoy the feeling of getting smarter and more knowledgeable while in reality staying as dumb as we were. This warm feeling disappears quickly when we try to explain what we read in our own words in writing. Suddenly, we *see* the problem. The attempt to rephrase an argument in our own words confronts us without mercy with all the gaps in our understanding. It certainly feels less good, but this struggle is the only chance we have to improve our understanding, to learn and move forward (cf. below). This, again, is deliberate practice. Now we are faced with a clear choice: We have to choose between feeling smarter or becoming smarter. And while writing down an idea feels like a detour, extra time spent, not writing it down is the real waste of time, as it renders most of what we read as ineffectual.

Understanding is not just a precondition to learning something. To a certain degree, learning *is understanding.* And the mechanisms are not so different, either: We can only improve our learning if we test ourselves on our progress. Here, too, rereading or reviewing does not confront us with the things we haven't learned yet, although it makes us feel like we have. Only the actual attempt to retrieve information will clearly show us if we have learned something or not. The mere-exposure effect would fool us here, too: Seeing something we have seen before causes the same emotional reaction *as if* we had been able to retrieve the information from our memory. Rereading, therefore, makes us feel we have learned what we read: "I know that already!" Our brains are terrible teachers in this regard. We face here the same choice between methods that make us feel like we learned something and methods that truly do make us learn something.

If you now think: "That's ridiculous. Who would want to read and pretend to learn just for the illusion of learning and understanding?" please look up the statistics: The *majority* of students chooses every day not to test themselves in any way. Instead, they apply the very method research has shown again (Karpicke, Butler, and Roediger 2009) and again (Brown 2014, ch. 1) to be almost completely useless: rereading and underlining sentences for later rereading. And most of them choose that method, *even if they are taught that they don't work*. Consciously, we probably would all choose the same, but what really matters are the many small, implicit choices we have to

make every day, and they are most often made unconsciously.

This is why choosing an external system that forces us to deliberate practice and confronts us as much as possible with our lack of understanding or not-yet-learned information is such a smart move. We only have to make the conscious choice once.

10.5 Learn by Reading

Learning itself requires deliberate practice, and I mean actual learning that helps us to increase our understanding of the world, not just the learning that makes us pass a test. And deliberate practice is demanding; it requires effort. Trying to skip this step would be like going to the gym and trying to work out with the least effort possible. That just doesn't make sense, just like it wouldn't make sense to hire a coach to do the heavy lifting. A coach is not there to do the work, but to show us how to use our time and effort in the most effective way. What is self-evident in sports we are only starting to realise is true for learning as well. "The one who does the work does the learning," writes Doyle (2008, 63). It is hard to believe, but in education that is still a revolutionary idea.

Learning requires effort, because we have to think to understand and we need to actively retrieve old knowledge to convince our brains to connect it with new ideas as cues. To understand how groundbreaking this idea is, it helps to remember how much effort teachers still put into the attempt to make learning easier for their students by prearranging information, sorting it into modules, categories and themes. By doing that, they achieve the opposite of what they intend to do. They make it harder for the student to learn because they set everything up for reviewing, taking away the opportunity to build meaningful connections and to make sense of something by translating it into one's own language. It is like fast food: It is neither nutritious nor very enjoyable, it is just *convenient*.

It would be surprising if teachers changed the topic in the middle of the lesson, moving on to the next chapter before anyone had the chance to really understand the first one, only to come back to the previous topic later. It would also be unexpected to test the students constantly, half of the time about things that weren't even mentioned yet. But as much as it would probably annoy the students, who are used to having their material presented in neat categories, it would force them to make sense of what they encounter

– and that would make them really learn it.

> "Manipulations such as variation, spacing, introducing contextual interference, and using tests, rather than presentations, as learning events, all share the property that they appear during the learning process to impede learning, but they then often enhance learning as measured by post-training tests of retention and transfer. Conversely, manipulations such as keeping conditions constant and predictable and massing trials on a given task often appear to enhance the rate of learning during instruction or training, but then typically fail to support long-term retention and transfer" (Bjork, 2011, 8).

When we try to answer a question before we know how to, we will later remember the answer better, even if our attempt failed (Arnold and McDermott 2013). If we put effort into the attempt of retrieving information, we are much more likely to remember it in the long run, even if we fail to retrieve it without help in the end (Roediger and Karpicke 2006). Even without any feedback, we will be better off if we try to remember something ourselves (Jang et al. 2012). The empirical data is pretty unambiguous, but these learning strategies do not necessarily feel right. Intuitively, most students resort to cramming, which is just another term for reading something again and again in a failed attempt to learn it (Dunlosky et al. 2013). And as much as rereading doesn't help with learning, it certainly doesn't help with understanding. Admittedly, cramming does get information into your head for a short while – usually long enough to stay in there to pass a test. But cramming won't help you learn. As Terry Doyle and Todd Zakrajsek put it: "If learning is your goal, cramming is an irrational act" (Doyle and Zakrajsek 2013).[29]

Instead of reviewing a text, you could just as well play a round of ping-pong. In fact, chances are it would help you *more* because exercise helps to transfer information into long-term memory (cf. Ratey 2008). Plus, exercise reduces stress, which is good, because stress floods our brains with hormones that suppress learning processes (Baram et al. 2008).

In short: Pure re-viewing just doesn't make any sense, neither for understanding nor for learning. It is debatable if we even can call it learning.

It is not surprising, therefore, that the best-researched and most successful learning method is elaboration. It is very similar to what we do when we take smart notes and combine them with others, which is the opposite of mere re-viewing (Stein et al. 1984) Elaboration means nothing other than really thinking about the meaning of what we read, how it could inform different

questions and topics and how it could be combined with other knowledge. In fact, “Writing for Learning” is the name of an “elaboration method” (Gunel, Hand, and Prain 2007). But there is a caveat. Even though elaboration works verifiably well for deep understanding, it might not be the best choice if you just want to learn isolated encyclopaedic facts (Rivard 1994). But as long as you are not striving for a career as a quiz show candidate, why would you want that, anyway? The slip-box takes care of storing facts and information. Thinking and understanding is what it can’t take off your shoulders, which is why it makes sense to focus on this part of the work. That it facilitates learning as well is a nice side effect. Luhmann almost never read a text twice (Hagen 1997) and was still regarded as an impressive conversation partner who seemed to have all information ready to hand.[30]

Working with the slip-box, therefore, doesn’t mean storing information in there *instead* of in your head, i.e. not learning. On the contrary, it facilitates real, long-term learning. It just means not cramming isolated facts into your brain – something you probably wouldn’t want to do anyway. The objection that it takes too much time to take notes and sort them into the slip-box is therefore short-sighted. Writing, taking notes and thinking about how ideas connect is exactly the kind of elaboration that is needed to learn. Not learning from what we read because we don’t take the time to elaborate on it is the real waste of time.

There is a clear division of labour between the brain and the slip-box: The slip-box takes care of details and references and is a long-term memory resource that keeps information objectively unaltered. That allows the brain to focus on the gist, the deeper understanding and the bigger picture, and frees it up to be creative. Both the brain and the slip-box can focus on what they are best at.

11 Take Smart Notes

The educational psychologist Kirsti Lonka compared the reading approach of unusually successful doctoral candidates and students with those who were much less successful. One difference stood out as critical: The ability to think beyond the given frames of a text (Lonka 2003, 155f).

Experienced academic readers usually read a text with questions in mind and try to relate it to other possible approaches, while inexperienced readers tend to adopt the question of a text and the frames of the argument and take it as a given. What good readers can do is spot the limitations of a particular approach and see what is *not* mentioned in the text.

Even more problematic than staying within the given frame of a text or an argument is the inability to interpret particular information in the text within the bigger frame or argument of the text. Even doctoral students sometimes just collect de-contextualised quotes from a text – probably the worst possible approach to research imaginable. This makes it almost impossible to understand the actual meaning of information. Without understanding information within its context, it is also impossible to go beyond it, to reframe it and to think about what it could mean for another question.

Jerome Bruner, a psychologist Lonka refers to, goes a step further and says that scientific thinking is plainly impossible if we can't manage to think beyond a given context and we only focus on the information as it is given to us (Bruner, 1973, quoted after ibid.) It is not surprising, therefore, that Lonka recommends what Luhmann recommends: Writing brief accounts on the main ideas of a text instead of collecting quotes. And she also stresses that it is no less important to do something with these ideas – to think hard about how they connect with other ideas from different contexts and could inform questions that are not already the questions of the author of the respective text.

This is exactly what we do when we take the next step, in which we write and add permanent notes to the slip-box. We don't just play with ideas in our heads, but do something with them in a very concrete way: We think about what they mean for other lines of thoughts, then we write this explicitly on paper and connect them literally with the other notes.

11.1 Make a Career One Note at a Time

The first time one faces the challenge of writing a long text, say a dissertation, it is pretty normal to feel intimidated by the prospective of filling a few hundred pages with well-conceived ideas, source-based research and correct references on every page. If you don't feel some kind of respect for this task, there is something wrong with you. On the other hand, most people feel that writing a page a day (and having a day a week off) is quite manageable, not realising that this would mean finishing a doctoral thesis within a year – something that does not happen very often in reality.

The technique of writing a certain amount every day was perfected by Anthony Trollope, one of the most popular and productive authors of the 19th century: He would start every morning at 5:30 a.m. with a cup of coffee and a clock in front of him. Then he would write at least 250 words every 15 minutes. This, he writes in his autobiography: "allowed me to produce over ten pages of an ordinary novel volume a day, and if kept up through ten months, would have given as its results three novels of three volumes each in the year" (Trollope, 2008, 272). And that, mind you, was *before* breakfast.

Academic or nonfiction texts are not written like this because in addition to the writing, there is the reading, the research, the thinking and the tinkering with ideas. And they almost always take significantly more time than expected: If you ask academic or nonfiction writers, students or professors how much time they expect it would take them to finish a text, they systematically underestimate the time they need – even when they are asked to estimate the time under the worst-case scenario and if the real conditions turned out to be quite favourable (Kahneman 2013, 245ff). On top of that: half of all doctoral theses will stay unfinished *forever* (Lonka, 2003, 113). Academic and nonfiction writing is not as predictable as a Trollope novel and the work it involves certainly can't be broken down to something like "one page a day."

It does make sense to break down the work into manageable and measurable steps, but pages per day don't work that well as a unit when you also have to read, do research and think. But even though academic and nonfiction writing involve more of other types of work than fiction writing, Luhmann managed to beat Trollope in productivity if you count his articles as well as his books. Luhmann wrote 58 books and hundreds of articles,

while Trollope wrote 47 novels plus 16 other books. Granted, it might have something to do with the fact that Luhmann did some work after breakfast as well. But the main reason is the slip-box, which compares to Trollope's technique as investing with compounded interest compares to a piggy-bank. Trollope is like a diligent saver who puts a little sum to the side every day, which adds up over time toward something impressive. Three dollars put aside each day (say, one takeout coffee) add up over the year to a small vacation ($1,000) and over a working life to a deposit on a flat as a permanent holiday retreat.[31] Putting notes into the slip-box, however, is like investing and reaping the rewards of compounded interest (which would in this example almost pay for the whole flat).[32]

And likewise, the sum of the slip-box content is worth much more than the sum of the notes. More notes mean more possible connections, more ideas, more synergy between different projects and therefore a much higher degree of productivity. Luhmann's slip-box contains about 90,000 notes, which sounds like an incredibly large number. But it only means that he wrote six notes a day from the day he started to work with his slip-box until he died.

If you, by any chance, don't have the ambition to compete with him in terms of books per year, you could settle for three notes a day and still build up a significant critical mass of ideas in a very reasonable time. And you could settle for less than one book every twelve months. In contrast to manuscript pages per day, a certain number of notes a day is a reasonable goal for academic writing. And that is because taking a note and sorting it into the slip-box can be done in one go, while writing a manuscript page could involve weeks and months of preparation involving other tasks as well. You could therefore measure your daily productivity by the number of notes written.

11.2 Think Outside the Brain

Taking literature notes is a form of deliberate practice as it gives us feedback on our understanding or lack of it, while the effort to put into our own words the gist of something is at the same time the best approach to understanding what we read.

Taking permanent notes of our own thoughts is a form of self-testing as well: do they still make sense in writing? Are we even able to get the thought

on paper? Do we have the references, facts and supporting sources at hand? And at the same time, writing it is the best way to get our thoughts in order. Writing here, too, is not copying, but translating (from one context and from one medium into another). No written piece is ever a copy of a thought in our mind.

When we take permanent notes, it is much more a form of thinking within the medium of writing and in dialogue with the already existing notes within the slip-box than a protocol of preconceived ideas. Any thought of a certain complexity requires writing. Coherent arguments require the language to be fixed, and only if something is written down is it fixed enough to be discussed independently from the author. The brain alone is too eager to make us feel good – even if it is by politely ignoring inconsistencies in our thinking. Only in the written form can an argument be looked at with a certain distance – literally. We need this distance to think *about* an argument – otherwise the argument itself would occupy the very mental resources we need for scrutinizing it.

As we write notes with an eye towards existing notes, we take more into account than the information that is already available in our internal memory. That is extremely important, because the internal memory retrieves information not in a rational or logical way, but according to psycho-logical rules. The brain also doesn't store information neurally and objectively. We reinvent and rewrite our memory every time we try to retrieve information. The brain works with rules of thumb and makes things look as if they fit, even if they don't. It remembers events that never happened, connects unrelated episodes to convincing narratives and completes incomplete images. It cannot help but see patterns and meaning everywhere, even in the most random things (cf. Byrne, 2008). The brain, as Kahneman writes, is "a machine for jumping to conclusions" (Kahneman, 2013, 79). And a machine that is designed for jumping to conclusions is not the kind of machine you want to rely on when it comes to facts and rationality – at least, you would want to counterbalance it. Luhmann states as clearly as possible: it is not possible to think systematically without writing (Luhmann 1992, 53). Most people still think about thinking as a purely internal process, and believe that the only function of the pen is to put finished thoughts on paper. Richard Feynman once had a visitor in his office, a historian who wanted to interview him. When he spotted Feynman's notebooks, he said how delighted he was to

see such “wonderful records of Feynman’s thinking.”

“No, no!” Feynman protested. “They aren’t a record of my thinking process. They are my thinking process. I actually did the work on the paper.”

“Well,” the historian said, “the work was done in your head, but the record of it is still here.”

“No, it’s not a record, not really. It’s working. You have to work on paper, and this is the paper.”[33]

This, obviously, was a very important distinction to Feynman, much more than just a linguistic difference – and for a good reason: It is the distinction that makes all the difference when it comes to thinking.

Philosophers, neuroscientists, educators and psychologists like to disagree in many different aspects on how the brain works. But they no longer disagree when it comes to the need for external scaffolding. Almost all agree nowadays that real thinking requires some kind of externalization, especially in the form of writing. “Notes on paper, or on a computer screen [...] do not make contemporary physics or other kinds of intellectual endeavour easier, they make it possible” is one of the key takeaways in a contemporary handbook of neuroscientists (Levy 2011, 290) Concluding the discussions in this book, Levy writes: “In any case, no matter how internal processes are implemented, insofar as thinkers are genuinely concerned with what enables human beings to perform the spectacular intellectual feats exhibited in science and other areas of systematic enquiry, as well as in the arts, they need to understand the extent to which the mind is reliant upon external scaffolding.” (Ibid.) In our system, the scaffolding is done explicitly by connecting the thoughts within the external memory of the slip-box. Luhmann writes: “Somehow one has to mark differences, keep track of distinctions, either explicitly or implicitly in concepts,” because only if the connections are somehow fixed externally can they function as models or theories to give meaning and continuity for further thinking (Luhmann, 1992, 53).

A common way to embed an idea into the context of the slip-box is by writing out the reasons of its importance for your own lines of thought. For example, I recently read the book “Scarcity: Why Having Too Little Means So Much” (2013) by Mullainathan and Shafir. They investigate how the experience of scarcity has cognitive effects and causes changes in decision-

making processes. They help the reader understand why people with almost no time or money sometimes do things that don't seem to make any sense to outside observers. People facing deadlines sometimes switch frantically between all kinds of tasks. People with little money sometimes spend it on seeming luxuries like take-away food. From the outside, it would make more sense to do one thing at a time, or buy food in bulk and cook for yourself. The book is interesting, because the authors don't question this behavior rhetorically or even in a judgemental way, but investigate it as a universal human phenomenon.

I took some literature notes collecting reasons how and why humans act so very differently when they experience scarcity. This was step one, done with an eye towards the argument of the book. I had questions in mind like: Is this convincing? What methods do they use? Which of the references are familiar?

But the first question I asked myself when it came to writing the first permanent note for the slip-box was: What does this all mean for my own research and the questions I think about in my slip-box? This is just another way of asking: Why did the aspects I wrote down catch my interest?

If I were a psychologist, this book would interest me for completely different reasons than if I were a politician or a debt adviser, or if I had bought it out of personal interest. As someone with a sociological perspective on political questions and an interest in the project of a theory of society, my first note reads plainly: "Any comprehensive analysis of social inequality must include the cognitive effects of scarcity. Cf. Mullainathan and Shafir 2013." This immediately triggers further questions, which I can discuss on following notes, starting with: "Why?"

Now, I already have two notes in my slip-box, based on the literature notes I took while reading the book, but written along the lines of my own thinking. One note states the relevance of the book for my own thinking and one explains my idea in more detail. Here I could draw from my literature notes as a source of valuable facts and insight. Even though the answers to the question of why scarcity is relevant to the study of social inequality are all in the book, they are not just there to be copied. They need to be made explicit. That means to *think* about how the insight into cognitive effects of scarcity affects the analysis of social inequality.

While I am writing these notes, it becomes obvious that the answer to the

question “why” has already triggered more follow-up questions, like: Isn’t this already discussed in theories of social inequality? If yes: Who discussed it? If not: Why not? And where do I turn to, to find answers to these questions? Correct: The first choice for further inquiry is the slip-box. Maybe there is already something on social inequality that helps me to answer these questions, or at least an indication of where to look.

By skimming through the slip-box, I might discover that these ideas could also be helpful for another topic I haven’t thought about. One example is the question of personal responsibility, which is discussed on the example of obesity and the influence of hormones as a sub-topic to a philosophical discussion on free will. None of it needs to be discussed right away, especially as most of these ideas would require more research and reading. But there is also no reason not to write down these possible connections and come back to them later, if my research points me back to them. The more notes the slip-box contains, the more interesting and prolific this step will become and the more research questions will be triggered.

Just by writing down these questions and making possible connections explicit in writing are the concepts and theories being investigated. Their limitations become as visible as their particular angle on a problem. By explicitly writing down how something connects or leads to something else, we force ourselves to clarify and distinguish ideas from each other.

11.3 Learn by not Trying

> “Selection is the very keel on which our mental ship is built. And in this case of memory its utility is obvious. If we remembered everything, we should on most occasions be as ill off as if we remembered nothing. It would take as long for us to recall a space of time as it took the original time to elapse, and we should never get ahead with our thinking.” (William James 1890, 680).

We have seen in the first step that *elaboration* through taking smart literature notes increases the likelihood that we will remember what we read in the long term. But this was only the first step. Transferring these ideas into the network of our own thoughts, our latticework of theories, concepts and mental models in the slip-box brings our thinking to the next level. Now we elaborate these ideas within different contexts and connect them with other ideas in a durable fashion. The literature notes are going to be archived, which means the ideas would be lost in the reference system if we didn’t *do*

something with them. That is why we transfer them into our external memory, the slip-box, with which we have an ongoing dialogue and where they can become part of our active set of ideas.

Transferring ideas into the external memory also allows us to forget them. And even though it sounds paradoxical, forgetting actually facilitates long-term learning. It is important to understand why, because there are still many students who shy away from using an external memory. They fear that they would have to choose between remembering things in their heads (which wouldn't require an external memory) or in the external memory (which then would be forgotten in the internal memory). That this is a false choice becomes obvious as soon as we understand how our memory truly works.

To be able to remember everything and not having to resort to any external memory sounds great initially. But you might think differently if you are familiar with the story of a man who was really able to remember almost everything. The reporter Solomon Shereshevsky (Lurija 1987) is one of the most famous figures in the history of psychology. When his supervisor saw that he didn't take any notes during their meetings, he first doubted Shereshevsky's dedication to the job, but shortly after, it was rather his own sanity that he doubted.

When he confronted Shereshevsky with what seemed to him like lazy behaviour, Shereshevsky started to recount every single word that was spoken during the meeting and continued to recount verbatim all the meetings they had ever had. His colleagues were astonished, but the person most astonished was Shereshevsky himself. It was the first time he realised that everyone else seemed to have forgotten almost everything. Even those who had taken notes couldn't remember even a fraction of what seemed normal for him.

Aleksandr Romanovich Luria, the psychologist who subsequently tested him in all conceivable ways, couldn't find any of the usual restrictions people normally have in their memories. But it also became clear that this advantage came at a huge cost: It wasn't just that Shereshevsky was able to remember so much, he had trouble forgetting anything. The important things got lost under a pile of irrelevant details that involuntarily came to his mind. Although he was very good at remembering facts, Shereshevsky was almost incapable of getting the gist of something, the concepts behind the particulars and distinguishing the relevant facts from minor details. He had great trouble

relating to literature or poetry. He could repeat a novel word by word, but the greater meaning would be lost on him. While *Romeo and Juliet* is for most of us a story of love and tragedy, for him it would be the story of "Two households, both alike in dignity, In fair Verona where we lay our scene, From ancient grudge break to new mutiny, Where civil blood makes civil hands unclean..." It should be obvious that for academic thinking and writing, the gift of being able to remember everything is a serious liability.

The science of learning is still undecided on the question of whether we all share Shereshevsky's ability to memorise virtually everything we ever have encountered, but are only better at suppressing it. After all, sometimes we suddenly remember scenes from the past in great detail, triggered by a cue like the scent of a madeleine in Proust's recherche. These moments of involuntary memory might be like small cracks in the mental barrier through which we can catch a glimpse of all the memories we have collected over our lifetimes, but might never again have access to.

Forgetting, then, would not be the loss of a memory, but the erection of a mental barrier between the conscious mind and our long-term memory. Psychologists call this mechanism active inhibition (cf. MacLeod, 2007). It is easy to understand what it is good for: Without a very thorough filter, our brains would constantly be flooded by memories, making it impossible to focus on anything in our surroundings. That is what Shereshevsky struggled with in his life: There were moment where he tried to buy an ice cream, but some random word of the vendor triggered such an enormous amount of associations and memories that he would have to leave the shop, so overwhelming was this experience.

We are very dependent on a subconscious mechanism that reliably inhibits almost every memory every moment except the very, very few that are truly helpful in a situation. Unfortunately, we cannot just consciously pluck from our memory what we need like from a folder in an archive. That would require the memory we can choose from to be already in our conscious mind, which would render the mechanism of remembering redundant. Remembering is the very mechanism to bring a memory back into our conscious mind. Therefore, Shereshevsky might not have had an ability most of us do not posses, but *lacked* an ability we all posses: The ability to forget systematically – to inhibit most irrelevant information from being remembered.

Shereshevsky was still capable of inhibiting information, but even being much less fine-tuned can have serious consequences. Being too often overwhelmed by memories, associations and synesthetic experiences made it difficult for him to stay in a job and enjoy many of the things we highly value. Above all, it made it almost impossible for him to think in abstract terms.

Robert and Elizabeth Ligon Bjork from the University of California suggest distinguishing between two different measurements when it comes to memory: Storage strength and retrieval strength (Bjork 2011). They speculate that storage strength, the ability to store memories, only becomes greater over one's lifetime. We add more and more information to our long-term memory. Just by looking at the physical capacity of our brains, we can see that we could indeed probably store a lifetime and a bit of detailed experiences in it (Carey 2014, 42).

It is difficult, if not impossible, to verify this claim, but it does make sense to shift the attention from storage strength to retrieval strength. Learning would be not so much about saving information, like on a hard disk, but about building connections and bridges between pieces of information to circumvent the inhibition mechanism in the right moment. It is about making sure that the right "cues" trigger the right memory, about how we can think strategically to remember the most useful information when we need it.

This is far from self-evident. If we look at the current state of education, especially the learning strategies most students employ, we see that the vast majority of all learning still aims to improve "storage strength," even though it cannot be improved. It is still mostly about remembering isolated facts and not so much about building connections. This is what learning psychologists have rightfully given the derogative term "cramming:" the attempt to reinforce and solidify information in the brain by repetition. It is basically hammering facts into the brain as if they were carvings on an ancient stone tablet. Using fancy words and describing it as a "strengthening of the connections between neurons" does not change the fact that this attempt is futile.

If we instead focus on "retrieval strength," we instantly start to think strategically about what kind of cues should trigger the retrieval of a memory. There are no natural cues: Every piece of information can become the trigger for another piece of information. These can be associations like the scent of a

sweet, as the madeleine triggered childhood memories for Proust, but this kind of flashback is called “involuntary memory” for a reason: we can’t retrieve it on purpose. Then there are the accidental cues that become attached to information when we learn something in a particular environment. It is, for example, easier to remember something we have learned in school if we are tested for it in the same room with the same noise in the background (Bjork 2011, 14). Likewise, sometimes it is difficult to remember something from school when we are not sitting in the classroom where we learned it.

Obviously, we don’t want to have to rely on cues in the environment. This is not only impractical, but highly misleading: If we test ourselves repeatedly in the same context and environment in which we have learned something, it would make us overconfident in terms of learning success, because we would not be able to discount the environmental cues that probably won’t exist in the context in which we want to remember what we learned.

What does help for true, useful learning is to connect a piece of information to as many *meaningful* contexts as possible, which is what we do when we connect our notes in the slip-box with other notes. Making these connections deliberately means building up a self-supporting network of interconnected ideas and facts that work reciprocally as cues for each other.

Mistaking learning with cramming is still very much ingrained in our educational culture. When Hermann Ebbinghaus, the godfather of learning theory, tried to understand the basics of learning and measuring learning progress, he deliberately used meaningless bits of information like random letter combinations and made sure they bore no accidental meaning. From his understanding, meaning would distract from the actual learning process. But he didn’t realise that he was stripping the learning process from the very thing that *is* learning, which is making meaningful connections.

From the standpoint of evolution, it makes sense that our brains have a built-in preference to learn meaningful information and a disregard for meaningless letter combinations. But Ebbinghaus laid the foundation for a long-lasting and influential tradition of learning theories that separates understanding from learning.

Our fascination with memory artists can also be explained by this tradition. There is nothing interesting about the capability of a normal person to remember thousands of words, countless facts, numerous subjects, the names of celebrities, friends, family members and colleagues over a long period of

time. But when someone is able to remember a series of twenty or thirty seemingly meaningless bits of information almost instantly, it fascinates us and reminds us of our struggles at school.

The trick, of course, is not to learn like Ebbinghaus thought we would learn: by banging the information into our heads. Memory artists instead attach meaning to information and connect it to already known networks of connections in a meaningful way. One piece of information can become the cue for another and strings or networks of cues can be built. Those kinds of memory techniques are great in case you need to learn information that bears no meaning in itself or has no logical or meaningful connection to other things you already know. But why would you want to learn something like that – except when you happen to be a memory artist?

Memory techniques are the fix for a rather artificial situation. When it comes to academic writing, we don't have the need for this trick, as we can choose to build and think exclusively within meaningful contexts. Abstract information like bibliographic references can be stored externally – there is no benefit in knowing them by heart. Everything else better bear meaning.

The challenge of writing as well as learning is therefore not so much to learn, but to understand, as we will already have learned what we understand. The problem is that the meaning of something is not always obvious and needs to be explored. That is why we need to elaborate on it. But elaboration is nothing more than connecting information to other information in a *meaningful* way. The first step of elaboration is to think enough about a piece of information so we are able to write about it. The second step is to think about what it means for other contexts as well.

This is not so different from when elaboration is recommended as a "learning method." As a method, it has been proven to be more successful than any other approach (McDaniel and Donnelly 1996). This is not a new insight, either. After looking at various studies from the 1960s until the early 1980s, Barry S. Stein et al. summarises: "The results of several recent studies support the hypothesis that retention is facilitated by acquisition conditions that prompt people to elaborate information in a way that increases the distinctiveness of their memory representations." (Stein et al. 1984, 522)

Stein et al. illustrate how commonsensical this is on the example of a biology novice who learns the difference between veins and arteries: "[he] may find it difficult at first to understand and remember that arteries have

thick walls, are elastic, and do not have valves, whereas veins are less elastic, have thinner walls, and have valves" (ibid.). But by elaborating a little bit on this difference and asking the right questions, like "why?" the students can connect this knowledge with prior knowledge, like their understanding of pressure and the function of the heart. Just by making the connection to the common knowledge that the heart presses the blood into the arteries, they immediately know that these walls need to sustain more pressure, which means they need to be thicker than veins, in which the blood flows back to the heart with less pressure. And, of course, this makes valves necessary to keep the blood from flowing back. Once understood, the attributes and differences are almost impossible to disentangle from the knowledge of veins and arteries.

Learned right, which means understanding, which means connecting in a meaningful way to previous knowledge, information almost cannot be forgotten anymore and will be reliably retrieved if triggered by the right cues. Moreover, this new learned knowledge can provide more possible connections for new information. If you focus your time and energy on understanding, you cannot help but learn. But if you focus your time and energy on learning without trying to understand, you will not only not understand, but also probably not learn. And the effects are cumulative.

There is a reason why the best scientists are also often very good teachers. For someone like Richard Feynman, everything was about understanding, regardless of whether he was doing research or teaching. His famous Feynman diagrams are primarily tools to make understanding easier and his lectures are famous because they help students to really understand physics. It is not surprising, therefore, that he was passionate about challenging traditional education methods. He couldn't stand textbooks full of pseudo-explanations (Feynman 1985) and teachers who tried to make learning easier for students by using artificial "real-life" examples instead of using their actual prior understanding as a connection point (Feynman 1963).

Writing notes and sorting them into the slip-box is nothing other than an attempt to understand the wider meaning of something. The slip-box forces us to ask numerous elaborating questions: What does it mean? How does it connect to … ? What is the difference between … ? What is it similar to? That the slip-box is not sorted by topics is the precondition for actively building connections between notes. Connections can be made between

heterogeneous notes – as long as the connection makes sense. This is the best antidote to the impeding way most information is given to us in our learning institutions. Most often, it comes in modular form, sorted by topic, separated by disciplines and generally isolated from other information. The slip-box is forcing us to do the exact opposite: To elaborate, to understand, to connect and therefore to learn seriously.

The fact that too much order can impede learning has become more and more known (Carey 2014). Conversely, we know that the deliberate creation of variations and contrasts can facilitate learning. Nate Kornell and Bjork showed this when they experimentally taught students different art styles. First, they used the traditional approach of showing students one art style at a time using different paintings. Then, they deliberately mixed up the styles and shuffled the paintings around. The students who were presented paintings from different styles in no particular order learned to distinguish styles faster and were also much more successful at matching paintings to styles and artists they had never seen before. This shows that elaborating on the differences and similarities of notes instead of sorting them by topic not only facilitates learning, but facilitates the ability to categorise and create sensible classifications!

11.4 Adding Permanent Notes to the Slip-Box

The next step after writing the permanent notes is to add them to the slip-box.

1. Add a note to the slip-box either behind the note you directly refer to or, if you do not follow up on a specific note, just behind the last note in the slip-box. Number it consecutively. The Zettelkasten numbers the notes automatically. “New note” will just add a note with a new number. If you click “New note sequence,” the new note will be registered at the same time as the note that follows the note currently active on the screen. But you can always add notes “behind” other notes anytime later. Each note can follow multiple other notes and therefore be part of different note sequences.
2. Add links to other notes or links on other notes to your new note.
3. Make sure it can be found from the index; add an entry in the index if necessary or refer to it from a note that is connected to the index.

4. Build a Latticework of Mental Models

12 Develop Ideas

> "Every note is just an element in the network of references and back references in the system, from which it gains its quality." (Luhmann 1992)

Ideally, new notes are written with explicit reference to already existing notes. Obviously, this is not always possible, especially in the beginning when the slip-box is still in its infancy, but it will very soon become the first option most of the time. Then you can put the new note "behind" an existing, related note straight away. Luhmann, working with pen and paper, would put a note behind an existing one and number it accordingly. If the existing note bore the number 21, he numbered the new note 22. If note number 22 already existed, he would still add it behind 21, but number it 21a. By alternating numbers and letters, he was able to branch out into an infinite number of sequences and sub-sequences internally with no hierarchical order.

An initial subsequence that attracts more and more follow-up notes can easily become a main topic with many subtopics over time (Schmidt 2013, 172). The digital Zettelkasten makes things easier: numbers are assigned automatically, note sequences can be constructed any time later and one note can become the follow-up note to different notes at the same time.

These note sequences are the backbone of text development. They combine the advantages of an abstract with a topic-related order. A pure topic-related order would have to be organised top down and requires a hierarchical order up front. A pure abstract order would not allow idea clusters and topics to be built bottom up. The individual notes would stay mostly independent and isolated with only one-dimensional references – pretty much like a one-person Wikipedia stripped of the knowledge and fact-checking abilities of the community.

But a loose order of sequences allows freedom to change course when necessary and provides enough structure to build up complexity. Notes are only as valuable as the note and reference networks they are embedded in.

Because the slip-box is not intended to be an encyclopaedia, but a tool to think with, we don't need to worry about completeness. We don't need to write anything down just to bridge a gap in a note sequence. We only write if it helps us with our own thinking. The gaps we do need to concern ourselves

with are the gaps in the arguments in the final manuscript – but these gaps will only become obvious in the next step, when we take the relevant notes for an argument out of the network of the slip-box and sort them into the linear order for the rough draft.

As the slip-box is not a book with just one topic, we don't need to have an overview of it. On the contrary, we are much better off accepting as early as possible that an overview of the slip-box is as impossible as having an overview of our own thinking *while* we are thinking. As an extension of our own memory, the slip-box is the medium we think *in*, not something we think *about*. The note sequences are the clusters where order emerges from complexity. We extract information from different linear sources and mix it all up and shake it until new patterns emerge. Then, we form these patterns into new linear texts.

12.1 Develop Topics

After adding a note to the slip-box, we need to make sure it can be found again. This is what the index is for. Luhmann wrote an index with a typewriter on index cards. In the Zettelkasten, keywords can easily be added to a note like tags and will then show up in the index. They should be chosen carefully and sparsely. Luhmann would add the number of one or two (rarely more) notes next to a keyword in the index (Schmidt 2013, 171). The reason he was so economical with notes per keyword and why we too should be very selective lies in the way the slip-box is used. Because it should not be used as an archive, where we just take out what we put in, but as a system to think with, the references between the notes are much more important than the references from the index to a single note. Focusing exclusively on the index would basically mean that we always know upfront what we are looking for – we would have to have a fully developed plan in our heads. But liberating our brains from the task of organizing the notes is the main reason we use the slip-box in the first place.

The file-box can do much more than just hand out what we request. It can surprise and remind us of long-forgotten ideas and trigger new ones. This crucial element of surprise comes into play on the level of the interconnected notes, not when we are looking for particular entries in the index. Most notes will be found through other notes. The organisation of the notes is in the network of references in the slip-box, so all we need from the index are entry

points. A few wisely chosen notes are sufficient for each entry point. The quicker we get from the index to the concrete notes, the quicker we move our attention from mentally preconceived ideas towards the fact-rich level of interconnected content, where we can conduct a fact-based dialogue with the slip-box.

Even though we will not get an overview of the whole slip-box (as we certainly will never get an overview of our whole internal memory), we can get an overview of a specific topic. But because the structure of topics and subtopics is not a given, but the outcome of our thinking, they too are subject to ongoing considerations and alteration. The consideration of how to structure a topic, therefore, belongs on notes as well – and not on a meta-hierarchical level. We can provide ourselves with a (temporarily valid) overview over a topic or subtopic just by making another note. If we then link from the index to such a note, we have a good entry point. If the overview on this note ceases to correctly represent the state of a cluster or topic, or we decide it should be structured differently, we can write a new note with a better structure and update the respective link from the index. This is important: Every consideration on the structure of a topic is just another consideration on a note – bound to change and dependent on the development of our understanding.

The way people choose their keywords shows clearly if they think like an archivist or a writer. Do they wonder where to *store* a note or how to *retrieve* it? The archivist asks: Which keyword is the most fitting? A writer asks: In which circumstances will I want to stumble upon this note, even if I forget about it? It is a crucial difference.

Let's assume I want to add a short note that says: "Tversky/Kahneman (1973) showed in an experiment that people are more likely to overestimate the likelihood of an event to happen if they are able to conceive it well and in detail than if it were abstract." If you think in terms of archiving, you might feel keywords like "misjudgements," "experimental psychology" or "experiment" would be fitting. In this case, you would think in general categories like "subject," "discipline" or "method." It is rather unlikely that you will ever think of writing an article based on all notes to "experimental psychology" or see the need for retrieving all notes filed under "experiment." Maybe you will think about a book that collects "misjudgements," but it is unlikely that you could turn any of these piles of notes into a structured

argument.

As writers, we approach the question of keywords differently. We look at our slip-box for already existing lines of thought and think about the questions and problems already on our minds to which a new note might contribute.

If you are an economist working on decision-making, you might think of the preferences management often shows for projects with an easy-to-visualise outcome over more profitable ones. A fitting keyword would then be “capital allocation problems.” By assigning the keyword alone, the note is already put into a specific context, which gives it a particular meaning and triggers context-specific questions like: If this is a systematic effect, can it be measured? Has someone already measured it? Does the effect show up in available data, like the market value of publicly listed companies, and if so, is it that companies with products that are easy to visualise have richer valuations than those who offer services or products that are rather difficult to grasp? And if not: Is it because the experimental findings cannot be extrapolated or is it because the knowledge is already publicly available and therefore priced in? If not, is it another argument against the Efficient Market hypothesis or just a good way to stack the odds in the stock market in your favour?

By assigning this keyword, you might stumble upon already existing notes on capital allocation, which either help to answer these questions or trigger new ones. But maybe you are a political scientist and read this note as an answer to the question of why certain topics are discussed during an election and others not, or why it could be politically more sensible to promote easy-to-visualise solutions over solutions that really work. Fitting keywords here might be “political strategies,” “elections” or “dysfunctionalities, political.”

Keywords should always be assigned with an eye towards the topics you are working on or interested in, never by looking at the note in isolation. This is also why this process cannot be automated or delegated to a machine or program – it requires thinking. The Zettelkasten does make suggestions based on existing keywords and scans for keywords in the text you wrote. But it makes sense to see these suggestions more as a warning sign than an invitation to use them: these are the most obvious ideas and probably not the best ones. Good keywords are usually not already mentioned as words in the note. Assume I have the note “A sudden increase of ad-hoc theories is for

Kuhn a sign that a normal-science phase might be in crisis (Kuhn 1967, 96).” A fitting keyword might be “paradigm change,” but that phrase is not in the note and therefore would not be suggested by the program.

Assigning keywords is much more than just a bureaucratic act. It is a crucial part of the thinking process, which often leads to a deeper elaboration of the note itself and the connection to other notes.

12.2 Make Smart Connections

In the digital version of the Zettelkasten, all we need to do is to click on “Links” and add the number of the note we want to refer to. It then automatically adds a backlink to the note we refer from. Even though the Zettelkasten makes suggestions here, too, for example based on joint literature references, making good cross-references is a matter of serious thinking and a crucial part of the development of thoughts.

Luhmann used four basic types of cross-references in his file-box (Schmidt 2013, 173f; Schmidt 2015, 165f). Only the first and last are relevant for the digital Zettelkasten, the other two are merely compensating for restrictions of the analogue pen and paper version. You don’t need to concern yourself with them if you use the digital program.

1. The first type of links are those on notes that are giving you the overview of a topic. These are notes directly referred to from the index and usually used as an entry point into a topic that has already developed to such a degree that an overview is needed or at least becomes helpful. On a note like this, you can collect links to other relevant notes to this topic or question, preferably with a short indication of what to find on these notes (one or two words or a short sentence is sufficient). This kind of note helps to structure thoughts and can be seen as an in-between step towards the development of a manuscript. Above all, they help orientate oneself within the slip-box. You will know when you need to write one. Luhmann collected up to 25 links to other notes on these kind of entry notes. They don’t have to be written in one go as links can be added over time, which again shows how topics can grow organically. What we think is relevant for a topic and what is not depends on our current understanding and should be taken quite seriously: It defines an idea as much as the facts it is based on. What we regard as being relevant for a topic and how we

structure it will change over time. This change might lead to another note with a different, more adequate topic structure, which then can be seen as a comment on the previous note. Thankfully, it won't make all the other notes redundant. As mentioned before: All we have to do is to change the entry in the index to this new note and/or indicate on the old note that we now consider a new structure more fitting.

2. A similar though less crucial kind of link collection is on those notes that give an overview of a local, physical cluster of the slip-box. This is only necessary if you work with pen and paper like Luhmann. While the first type of note gives an overview of a topic, regardless of where the notes are located within the slip-box, this type of note is a pragmatic way of keeping track of all the different topics discussed on the notes that are physically close together. As Luhmann put notes between notes to internally branch out subtopics and sub-subtopics, original lines of thoughts were often interrupted by hundreds of different notes. This second type of note keeps track of the original lines of thought. Obviously, we don't need to worry about this if we work with the digital version.

3. Equally less relevant for the digital version are those links that indicate the note to which the current note is a follow-up and those links that indicate the note that follows on the current note. Again, this is only relevant to see which notes follow each other, even if they don't physically stand behind each other anymore. The digital Zettelkasten automatically adds these kinds of backlinks and presents you the relevant notes in a note sequence.

4. The most common form of reference is plain note-to-note links. They have no function other than indicating a relevant connection between two individual notes. By linking two related notes regardless of where they are within the slip-box or within different contexts, surprising new lines of thought can be established. These note-to-note links are like the "weak links" (Granovetter 1973) of social relationships we have with acquaintances: even though they are usually not the ones we turn to first, they often can offer new and different perspectives.

These links can help us to find surprising connections and similarities between seemingly unrelated topics. Patterns might not become visible right

away, but they might emerge after multiple note-to-note links between two topics have been established. It is no coincidence that one of the main features of Luhmann's theory of social systems is its discovery of structural patterns that could be found in very different parts of society. For example, he was able to show how vastly different things like money, power, love, truth and justice can be seen as social inventions that solve structurally similar problems (they all can be seen as media that make the acceptance of certain communication offers more likely, cf. Luhmann 1997, chapter 9–12). Observations like these could never be done nor explained by someone who is working with a system that keeps things neatly separated by preconceived themes and topics.

It is important to always keep in mind that making these links is not a chore, a kind of file-box maintenance. The search for meaningful connections is a crucial part of the thinking process towards the finished manuscript. But here, it is dealt with in a very concrete way. Instead of figuratively searching our internal memory, we literally go through the file-box and look for connections. By dealing with actual notes, we are also less prone to imagine connections where there aren't any, as we can see in black and white if something makes sense or not.

As we are making these connections, we build up an internal structure of the slip-box, which is shaped by our thinking. While this structure builds up externally and independently of our limited memory, it will, in return, shape our thinking as well and help us to think in a more structured way. Our ideas will be rooted in a network of facts, thought-through ideas and verifiable references. The slip-box is like a well-informed but down-to-earth communication partner who keeps us grounded. If we try to feed it some lofty ideas, it will force us to check first: What is the reference? How does that connect to the facts and the ideas you already have?

12.3 Compare, Correct and Differentiate

If you use the slip-box for a while, you will inevitably make a sobering discovery: The great new idea you are about to add to the slip-box turns out to be already in there. Even worse, chances are this idea wasn't even yours, but someone else's. Having the same thought twice or mistaking another person's idea with our own is far from unusual. Unfortunately, most people never notice this humbling fact because they have no system that confronts

them with already thought thoughts. If we forget about an idea and have it again, our brains get as excited as if we are having it the first time. Therefore, working with the slip-box is disillusioning, but at the same time it increases the chance that we actually move forward in our thinking towards uncharted territory, instead of just *feeling* like we are moving forward.

Sometimes, the confrontation with old notes helps to detect differences we wouldn't have noticed otherwise. What seems to be the same idea sometimes turns out to be slightly, but crucially, different. We then can explicitly discuss this difference on another note. This is especially helpful when two authors use the same concept in slightly different ways. The clarification of differences in the use of words and concepts is a major part of every serious academic work anyway – but it is so much easier if you have a nit-picking partner like the slip-box. If we had written just excerpts or notes that we had kept in separate places, these differences would only become obvious if we had all the relevant notes on our minds at the same time. It is much easier to detect these small but crucial differences when we literally have our notes in front of our eyes, comparing them during our attempts to connect them. The brain is very good at making associations and spotting patterns and similarities between seemingly different things and also very good in spotting differences between seemingly similar things, but it needs to have them presented objectively and externally. It is much easier to *see* differences and similarities than to detect them by mere thinking.

Comparing notes also helps us to detect contradictions, paradoxes or oppositions – important facilitators for insight. When we realise that we used to accept two contradicting ideas as equally true, we know that we have a problem – and problems are good because we now have something to solve. A paradox can be a sign that we haven't thought thoroughly enough about a problem or, conversely, that we exhausted the possibilities of a certain paradigm. Finally, oppositions help to shape ideas by providing contrast. Albert Rothenberg suggests that the construction of oppositions is the most reliable way of generating new ideas (Rothenberg 1971; 1996; 2015).

The constant comparing of notes also serves as an ongoing examination of old notes in a new light. I am surprised how often the addition of one note leads to a correction, a complementation or an improvement of old ideas. Sometimes, we discover that the source given in a text is not the actual source. Sometimes, we discover that the interpretation of a study conflicts

with another interpretation, making us realise that the study is so vague that it can be used as proof for two contradicting interpretations. Sometimes, we find two unrelated studies that give proof to the same point, which is not a correction, but an indication that we are on to something. Adding new notes to old notes and being forced to compare them leads not only to a constant improvement of one's own work, but often discloses weaknesses in the texts we read. We have to compensate for that by being extra critical as readers and careful with extracting information from texts, and we always have to check the original source of a claim.[34]

The slip-box not only confronts us with dis-confirming information, but also helps with what is known as the feature-positive effect (Allison and Messick 1988; Newman, Wolff, and Hearst 1980; Sainsbury 1971). This is the phenomenon in which we tend to overstate the importance of information that is (mentally) easily available to us and tilts our thinking towards the most recently acquired facts, not necessarily the most relevant ones. Without external help, we would not only take exclusively into account what we know, but what is on top of our heads.[35] The slip-box constantly reminds us of information we have long forgotten and wouldn't remember otherwise – so much so, we wouldn't even look for it.

12.4 Assemble a Toolbox for Thinking

Just by working with the slip-box, we retrieve old ideas and facts on an irregular basis and connect them with other bits of information – very much how experts recommend we learn (Bjork 2011, 8; Kornell and Bjork 2008). This is also the idea behind flashcards. But even though flashcards are much more effective than cramming or reviewing information within the context of a textbook, they also have a downside: The information on flashcards is neither elaborated on nor embedded in some form of context. Each flashcard stays isolated instead of being connected with the network of theoretical frames, our experiences or our latticework of mental models. This not only makes it much more difficult to learn, but also difficult to understand the implications and the meaning of information (cf. Birnbaum et al., 2013). A scientific term or concept only becomes meaningful within the context of a theory – otherwise it would just be a word.

The same is true for everyday situations. Our ability to read a situation or

to interpret information depends on our broader knowledge and how we make sense of it. Science and everyday life are in this regard not so different; both are intertwined. Scientific work is much more pragmatic and less determined by theory than outsiders would expect (Latour and Woolgar 1979). At the same time, we use scientific knowledge and theories to make sense of our surroundings every day. And some theories or theoretical models are surprisingly versatile, which is why it makes sense to assemble a toolbox of useful mental models (Manktelow and Craik 2004) that could help with our daily challenges and make sense of the things we learn and encounter.

Charlie Munger, Warren Buffett's partner and vice chairman of Berkshire Hathaway, stresses the importance of having a broad theoretical toolbox – not to be a good academic, but to have a good, pragmatic grip on reality. He regularly explains to students which mental models have proven most useful to help him understand markets and human behaviour. He advocates looking out for the most powerful concepts in every discipline and to try to understand them so thoroughly that they become part of our thinking. The moment one starts to combine these mental models and attach one's experiences to them, one cannot help but gain what he calls "worldly wisdom." The importance is to have not just a few, but a broad range of mental models in your head. Otherwise, you risk becoming too attached to one or two and see only what fits them. You would become the man with a hammer who sees nails everywhere (cf. Maslow, 1966, 15).

Munger writes: "Well, the first rule is that you can't really know anything if you just remember isolated facts and try and bang 'em back. If the facts don't hang together on a latticework of theory, you don't have them in a usable form. You've got to have models in your head. And you've got to array your experience, both vicarious and direct, on this latticework of models. You may have noticed students who just try to remember and pound back what is remembered. *Well, they fail in school and in life*. You've got to hang experience on a latticework of models in your head." (Munger 1994).

A truly wise person is not someone who knows everything, but someone who is able to make sense of things by drawing from an extended resource of interpretation schemes. This stands in harsh contrast to the common but not-so-wise belief that we need to learn from experience. It is much better to learn from the experiences of others – especially when this experience is reflected on and turned into versatile "mental models" that can be used in

different situations.

When we delegate the storage of knowledge to the slip-box and at the same time focus on the principles behind an idea while we write, add and connect notes, when we look for patterns and think beyond the most obvious interpretation of a note, when we try to make sense of something, combine different ideas and develop lines of thought, we do exactly that: we build up a "latticework of mental models" instead of just "remembering isolated facts and try and bang 'em back."

The beauty of this approach is that we co-evolve with our slip-boxes: we build the same connections in our heads while we deliberately develop them in our slip-box – and make it easier to remember the facts as they now have a latticework we can attach them to. If we practice learning not as a pure accumulation of knowledge, but as an attempt to build up a latticework of theories and mental models to which information can stick, we enter a virtuous circle where learning facilitates learning.

Helmut D. Sachs puts it like this:

> "By learning, retaining, and building on the retained basics, we are creating a rich web of associated information. The more we know, the more information (hooks) we have to connect new information to, the easier we can form long-term memories. […] Learning becomes fun. We have entered a virtuous circle of learning, and it seems as if our long-term memory capacity and speed are actually growing. On the other hand, if we fail to retain what we have learned, for example, by not using effective strategies, it becomes increasingly difficult to learn information that builds on earlier learning. More and more knowledge gaps become apparent. Since we can't really connect new information to gaps, learning becomes an uphill battle that exhausts us and takes the fun out of learning. It seems as if we have reached the capacity limit of our brain and memory. Welcome to a vicious circle. Certainly, you would much rather be in a virtuous learning circle, so to remember what you have learned, you need to build effective long-term memory structures." (Sachs 2013, 26)

His recommendations for learning read almost like instructions for the slip-box:

1. Pay attention to what you want to remember.
2. Properly encode the information you want to keep. (This includes thinking about suitable cues.)
3. Practice recall. (Ibid., 31)

We learn something not only when we connect it to prior knowledge and try to understand its broader implications (elaboration), but also when we try to

retrieve it at different times (spacing) in different contexts (variation), ideally with the help of chance (contextual interference) and with a deliberate effort (retrieval). The slip-box not only provides us with the opportunity to learn in this proven way, it forces us to do exactly what is recommended just by using it. We have to elaborate on what we read just to be able to write it down and translate it into different contexts. We retrieve information from the slip-box whenever we try to connect new notes with old notes. Just by doing this, we mix up contexts, shuffle notes and retrieve the information in irregular intervals. And along the way, we further elaborate on the information, which we always retrieve deliberately.

12.5 Use the Slip-Box as a Creativity Machine

> "Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn't really do it, they just saw something." (Steve Jobs)

Many exciting stories from scientific history make us believe that great insight comes in a flash. There is the sudden insight of Watson and Crick that DNA would have to have the form of a double helix or the story of Friedrich August Kekulé, who allegedly dreamed of a snake biting its own tail and suddenly saw the structure of benzene in front of his eyes.

But the reason why Watson and Crick or Kekulé had these insights and not a random person on the street is that they already had spent a very long time thinking hard about the problems, tinkered with other possible solutions and tried countless other ways of looking at the problem. Our fascination with these stories clouds the fact that all good ideas need time. Even sudden breakthroughs are usually preceded by a long, intense process of preparation.

Being experienced with a problem and intimately familiar with the tools and devices we work with, ideally to the point of virtuosity, is the precondition for discovering their inherent possibilities, writes Ludwik Fleck, a historian of science (Fleck 2012, 126). This is true even for purely theoretical work. Here, too, we need experience until we can "feel our way" around the problems and questions we deal with, even if these things are words, concepts and notes in a file system. What we learn in practice is always much more thorough and complex than what we could put into words. That is why even purely theoretical work cannot be reduced to explicit knowledge, which is consciously available. This is especially true for the use of a slip-box. It is the intuition that comes from the intimate knowledge of a

practice that can lead us to new insights. We might not be able to explicitly state why it is more promising to follow one idea instead of another, but being experienced, we somehow know – which is enough. Experimental scientists regularly describe their decision-making process as being based on intuition (Rheinberger 1997), and there is no reason why it should be different in the social sciences. Maybe it is just harder to accept in the social sciences as we try so hard to be more like natural scientists, who *seem* to do without something as vague as intuition. But intuition is not the opposition to rationality and knowledge, it is rather the incorporated, practical side of our intellectual endeavours, the sedimented experience on which we build our conscious, explicit knowledge (cf. Ahrens 2014).

Steven Johnson, who wrote an insightful book about how people in science and in general come up with genuine new ideas, calls it the "slow hunch." As a precondition to make use of this intuition, he emphasises the importance of experimental spaces where ideas can freely mingle (Johnson 2011). A laboratory with open-minded colleagues can be such a space, much as intellectuals and artists freely discussed ideas in the cafés of old Paris. I would add the slip-box as such a space in which ideas can mingle freely, so they can give birth to new ones.

Most often, innovation is not the result of a sudden moment of realization, anyway, but incremental steps toward improvement. Even groundbreaking paradigm shifts are most often the consequence of many small moves in the right direction instead of one big idea. This is why the search for small differences is key. It is such an important skill to see differences between seemingly similar concepts, or connections between seemingly different ideas. This even used to be the meaning of the word "new." "Novus," in Latin, used to mean "different," "unusual," not so much "genuinely new" in the meaning of "unheard" (Luhmann, 2005, 210). To have concrete notes in front of our eyes and be able to compare them directly makes differences, even small ones, much easier to spot. (This is an advantage of the original paper slip-box, as you can spread out multiple notes on a desk instead of just seeing them on a computer screen.) The neurobiologist James Zull points out that *comparing* is our natural form of perception, where our cognitive interpretation is in lockstep with our actual eye movements. Therefore, comparing should be understood quite literally.

We even compare when we focus on one thing: "Paying attention does not

mean unrelenting attention on one focal point. Our brains evolved to notice details by shifting focus from one area to another, by repeatedly scanning the surroundings. [...] The brain is more likely to notice details when it scans than when it focuses." (Zull 2002, 142f) This is one of the reasons why thinking works so much better when we have the very things we think about in front of our eyes. It is in our nature.

12.6 Think Inside the Box

> "[C]reative people are better at recognizing relationships, making associations and connections and seeing things in an original way—seeing things that others cannot see" (Andreasen 2014).

Comparing, differentiating and connecting notes are the basis of good academic writing, but playing and tinkering with ideas is what leads to insight and exceptional texts.

To be able to play with ideas, we first have to liberate them from their original context by means of abstraction and re-specification. We did this when we took literature notes and translated them into the different contexts within the slip-box. Abstraction does not have a good reputation at the moment. It is the tangible, the concrete that is cheered for. Abstraction should indeed not be the final goal of thinking, but it is a necessary in-between step to make heterogeneous ideas compatible. If Darwin had never abstracted from his concrete observations of sparrows, he would never have found an abstract, a general principle of evolution across different species, and he would never have been able to see how evolution works in other species as well. Abstraction is also not for theoretical-academic processes of insight only. We need to abstract from concrete situations every day. Only by abstraction and re-specification can we apply ideas in the singular and always different situations in reality (Loewenstein, 2010).

Even very personal, intimate experiences, like encounters with art, require abstraction. If the story of Romeo and Juliet touches us, it is certainly not because we are all members of one of two feuding families in Verona. We abstract from time and place, from the particular circumstances until we can meet the protagonists of this story on a general level where our own emotional life can resonate with what we see on stage. The tendency to juxtapose abstraction with being worldly or to associate it with intellectualism and juxtapose it with being solution-orientated is very

misleading indeed.

Studies on creativity with engineers show that the ability to find not only creative, but functional and working solutions for technical problems is equal to the ability to make abstractions. The better an engineer is at abstracting from a specific problem, the better and more pragmatic his solutions will be – even for the very problem he abstracted from (Gassmann and Zeschky, 2008, 103). Abstraction is also the key to analyse and compare concepts, to make analogies and to combine ideas; this is especially true when it comes to interdisciplinary work (Goldstone and Wilensky 2008).

Being able to abstract and re-specify ideas is, again, only one side of the equation. It is not good for anything if we don't have a system in place that allows us to put this into practice. Here, it is the concrete standardization of notes in just one format that enables us to literally shuffle them around, to add one idea to multiple contexts and to compare and combine them in a creative way without losing sight of what they truly contain.

Creativity cannot be taught like a rule or approached like a plan. But we can make sure that our working environment allows us to be creative with ideas. It also helps to keep in mind some creativity-inducing ideas about problem-solving that might be counterintuitive. It is worth it to dwell on this subject a little bit before we move on to the next step: the preparation of the rough draft of the manuscript.

The real enemy of independent thinking is not an external authority, but our own inertia. The ability to generate new ideas has more to do with breaking with old habits of thinking than with coming up with as many ideas as possible. For obvious reasons, I do not recommend "thinking outside the box". On the contrary, we can turn the slip-box into a tool for breaking out of our own thinking habits.

Our brains just love routines. Before new information prompts our brains to think differently about something, they make the new information fit into the known or let it disappear completely from our perception. Usually, we don't even notice when our brains modify our surroundings to make it fit its expectations. We need therefore a bit of a ruse to break the power of thinking routines. In their book with the showy title "The 5 Elements of Effective Thinking", the mathematicians Edward B. Burger and Michael Starbird collected different strategies to do that (2012). Some are already technically implemented in the slip-box, others are good to keep in mind.

For example, they emphasise the importance of feedback loops and the need to find ways to confront ourselves with our errors, mistakes and misunderstandings. This is a built-in feature of the slip-box. Another habit of the effective thinkers they highlight is their ability to focus on the main ideas behind the details, to grasp the gist of something. This, too, is something the slip-box nudges us to do.

Another piece of advice is not a feature of the slip-box and might sound banal, but it is crucial: Make sure that you really see what you think you see and describe it as plainly and factually as possible. Double-check if necessary. That this isn't as obvious as it sounds will become clearer by the fact that the ability to truly see what is in front of one's eyes is often listed as a trait of experts. And that is easily explained by the fact that our perception does not follow the order of seeing first and interpreting second. It does both at the same time: We always perceive something as something – our interpretation is instantaneous. This is why we have so much trouble not falling for an optical illusion: If we look at a three-dimensional drawing, we cannot see it just as an arrangement of lines and shapes – unless we are highly trained to do so. We don't even notice objectively missing parts in our perception, like the blind spot in the middle of everything we see. We need a trick to see what we don't see. As we always immediately see a whole picture of something, everything else, including the reinterpretation of it or the detection of missing bits, is a step that *follows*.

The same is true when we read: We don't see lines on a paper first, then realise that these are words, then use them to build sentences and finally decipher the meaning. We immediately read on the level of meaningful understanding. To *really* understand a text is therefore a constant *revision* of our first interpretation. We have to train ourselves to get used to seeing this difference and to hold back our ingrained urge to jump to conclusions. To be able to see what we see instead of what we *expect* to see is indeed a skill in itself, not like a character trait of being "open-minded." Those who think of themselves as being open-minded are often even more prone to stick to their first understanding as they believe to be without natural prejudices and therefore don't see the need to counterbalance them. If we think we can "hold back" an interpretation, we are fooling ourselves.

While the constant comparison of notes can help us to detect differences, no technique can help us see what is missing. But we can make it a habit to

always ask what is not in the picture, but could be relevant. This, too, does not come naturally to us.

One of the most famous figures to illustrate this skill is the mathematician Abraham Wald (Mangel and Samaniego 1984). During World War II, he was asked to help the Royal Air Force find the areas on their planes that were most often hit by bullets so they could cover them with more armour. But instead of counting the bullet holes on the returned planes, he recommended armouring the spots where none of the planes had taken any hits. The RAF forgot to take into account what was not there to see: All the planes that didn't make it back.

The RAF fell for a common error in thinking called survivorship bias (Taleb 2005). The other planes didn't make it back because they were hit where they should have had extra protection, like the fuel tank. The returning planes could only show what was less relevant.

Product developers make the same mistake on such a regular basis, one has to wonder if they do it on purpose. As marketing expert Robert McMath assembled the biggest-ever collection of supermarket products, he realised midway it was becoming almost exclusively a collection of failed products because they make up the vast majority of all products ever produced. He thought a museum would be a great place for product developers to see what already proved not to work so they didn't have to repeat the same mistake. Alas, rarely does a product developer show any interest in learning from the experience of others. Often, companies don't even keep track of their own failed attempts, providing McMath with whole series in which one kind of mistake was made in multiple variations, sometimes from each generation of developers in the same company (McMath and Forbes 1999).

In his beautifully titled book "The Antidote: Happiness for People Who Can't Stand Positive Thinking," Oliver Burkeman describes how much our culture is focused on success and how we neglect the important lessons from failure (Burkeman 2013). Manager biographies are a good example: Even though all of them contain some anecdotes about setbacks, these are always embedded in a bigger story about success (failed managers unfortunately rarely write biographies). If we try to extract a lesson from all these books, we might end up believing that persistence and charisma are paramount for success, even though these are exactly the same ingredients needed to screw a project up big time (Burkeman is referring to Jerker Denrell here). Obviously,

the same is true in research: It is very good to know what has already proven to not work if we try to come up with new ideas that do work.

One possibility to deal with this tendency is to ask counterfactual questions, like “what if?” (Markman, Lindberg, Kray and Galinsky, 2007). It is easier to learn about the function of money in a society if we wonder how strangers would exchange goods without using money than if we just focus on the obvious problems we have in a society based on money exchange. Sometimes, it is more important to rediscover the problems for which we already have a solution than to think solely about the problems that are present to us.

Problems rarely get solved directly, anyway. Most often, the crucial step forward is to redefine the problem in such a way that an already existing solution can be employed. The first question should always be directed towards the question itself: What kind of answer can you expect from asking a question in this particular way? What is missing?

Another seemingly banal tip relates to a distinguishing feature of extraordinary thinkers: Taking simple ideas seriously. Consider, for example, the idea of buying stocks low and selling them high. I am sure everyone can grasp that idea. But grasping an idea is not the same as understanding it. If you go and buy stocks on that “insight,” all you can do is to hope that a stock goes up after you buy it, which makes this knowledge about as useful as the tip on the next colour to choose on a roulette table.

The next level of understanding is reached when you realise what you buy if you buy a stock: a part of a company. Nobody would sign a contract for a house and believe it is the contract he owns now. But many people treat a stock exactly like this. They don’t really think about what they get for the price they pay: they just assume they made a good deal when the price is lower than the day before. But the only thing Warren Buffett thinks about it is the relationship between price and value – he doesn’t even look at the price from yesterday. He understands that simple is not the same as easy, and that the worst thing you can do is to make a simple task unnecessarily complicated. A stock is a share in a company. The price is set by the market, which means by supply and demand, which touches on the rationality of market participants as well as the question of valuation, which means you have to understand something about the business you are considering investing in, including competition, competitive advantages, technological

developments, etc.

Making things more complicated than they are can be a way to avoid the underlying complexity of simple ideas. This is what happened during the financial crisis of 2008: Economists developed hugely complicated products, but did not take into account the simple fact that price and value are not necessarily the same. There is a reason why Buffett is not only a great investor, but also a great teacher: He not only has a vast knowledge about everything related to business, he can also explain it all in simple terms.

Sometimes the breakthrough in a scientific process is the discovery of a simple principle behind a seemingly very complicated process. Burger and Starbird remind us of the long history of human attempts to fly: We tried to emulate birds by flapping wing-like apparatuses with feathers and all, but in the end, it was about not getting distracted by details and discovering that the subtle bending of the wing is the only thing that counts.

Simple ideas can be tied together into consistent theories and build up enormous complexity. This just doesn't work with complicated ideas. By using the slip-box on a daily basis, we train these important intellectual skills deliberately: We check if what we understood from a text is really in the text by having our understanding in written form in front of our eyes. We learn to focus on the gist of an idea by restricting ourselves in terms of space. We can make it a habit to always think about what is missing when we write down our own ideas. And we can practice asking good questions when we sort our notes into the slip-box and connect them with other notes.

12.7 Facilitate Creativity through Restrictions

The slip-box imposes quite a few restrictions on its user. Instead of having the choice between all kinds of fancy notebooks, papers or writing formats, or being able to employ the whole range of productivity tools available for note-taking, learning and academic or nonfiction writing, everything is reduced to a single plain-text format and collected in a single simple slip-box system with no frills or features. Even the computer program basically just emulates a wooden box filled with plain, consecutively numbered paper. And even though the digital program lifts the physical restrictions on the length of a note, I highly recommend treating a digital note as if the space were limited. By restricting ourselves to one format, we also restrict ourselves to just one idea per note and force ourselves to be as precise and brief as possible. The

restriction to one idea per note is also the precondition to recombine them freely later. Luhmann choose notes in the format A6. A good rule of thumb for working with the program is: Each note should fit onto the screen and there should be no need of scrolling.

Standardised is also the way we treat literature and our own thoughts: Instead of using different kinds of notes or techniques for different kinds of texts or ideas, the approach here is always the same, simple one. Literature is condensed on a note saying, “On page x, it says y,” and later stored with the reference in one place. Ideas and thoughts are captured on the slip-box notes and connected to other notes always in the same way in the same place. These standardizations make it possible that the technical side of note-taking can become automatic. Not having to think about the organisation is really good news for brains like ours – the few mental resources we have available, we need for thinking about the actual relevant questions: those concerning the contents.

This kind of self-imposed restriction is counterintuitive in a culture where more choice is usually regarded as a good thing and more tools to choose from seen as better than having less at hand. But not having to make decisions can be quite liberating. In his book “The Paradox of Choice,” Barry Schwartz used numerous examples, from shopping to career options to romance, to show that less choice can not only increase our productivity, but also our freedom and make it easier to be in the moment and enjoy it (Schwartz, 2007). Not having to make choices can unleash a lot of potential, which would otherwise be wasted on making these choices. Academic writing should definitely be added to Schwartz’ list of examples in which less choice is better.

The formal standardization of the slip-box might seem to be at odds with our search for creativity. But here, too, it is more likely the opposite is true. Thinking and creativity can flourish under restricted conditions and there are plenty of studies to back that claim (cf. Stokes 2001; Rheinberger 1997). The scientific revolution started with the standardization and controlling of experiments, which made them comparable and repeatable (cf. Shapin, 1996). Or think of poetry: It imposes restrictions in terms of rhythm, syllables or rhymes. Haikus give the poet very little room for formal variations, but that doesn’t mean they are equally limited in terms of poetic expressiveness. On the contrary: It is the strict formalism that allows them to transcend time and

culture.

Language in itself is extremely standardised and limited in many ways. We are restricted to the use of only 26 letters, but what that enables us to do! We can write novels, theories, love letters or court orders – just by rearranging these 26 letters. This is certainly not possible despite the restriction to 26 letters, but *because* of it. Nobody will open a book and wish it contains more types of letters or be disappointed because it is, again, just another variation of the same alphabet.[36]

A clear structure allows us to explore the internal possibilities of something. Even the act of breaking with convention depends on it. The limitation of the canvas does not make the artistic expressions of painters seem limited, but opens up the possibility of an artist like Lucio Fontana to cut into the canvas instead of painting on it. It is not even true that a more complex structure provides more possibilities. Quite the contrary. The binary code is radically more limited than the alphabet as it contains only two states, one or zero, but it opened up a range of creative possibilities that is unprecedented.

The biggest threat to creativity and scientific progress is therefore the opposite: a lack of structure and restrictions. Without structure, we cannot differentiate, compare or experiment with ideas. Without restrictions, we would never be forced to make the decision on what is worth pursuing and what is not. *Indifference* is the worst environment for insight. And the slip-box is, above all, a tool for enforcing distinctions, decisions and making differences visible. One thing is for sure: the common idea that we should liberate ourselves from any restrictions and “open ourselves up” to be more creative is very misleading indeed (Dean 2013, 201).

13 Share Your Insight

> "Writing itself makes you realise where there are holes in things. I'm never sure what I think until I see what I write. And so I believe that, even though you're an optimist, the analysis part of you kicks in when you sit down to construct a story or a paragraph or a sentence. You think, 'Oh, that can't be right.' And you have to go back, and you have to rethink it all." (Carol Loomis)[37]

Since writing is nothing more than the revision of a rough draft, which is nothing more than turning a series of notes into a continuous text, which are written on a day-to-day basis, connected and indexed in the slip-box, there is no need to worry about finding a topic to write about. Just look into your slip-box and see where clusters have been built up. These clusters are what caught your interest again and again, so you already know that you have found material to work with. Now you can spread out these notes on your desktop or use the outliner of the Zettelkasten, outline your argument and construct a preliminary order of sections, chapters or paragraphs. This will make questions, which are not answered, obvious, and it will show the gaps in the argument that need to be filled and make visible which parts still need some work.

The perspective changes another time: Now, it is not about understanding something in the context of another author's argument, and it is also not about looking for multiple connections in the slip-box, but about developing one argument and bringing it into the linearity of a manuscript. Instead of widening the perspective to find as many possible lines of thought to which an idea might contribute, it is now about narrowing the perspective, making a decision on one topic only and cutting out everything that does not directly contribute to the development of the text and support the main argument.

13.1 From Brainstorming to Slip-box-Storming

> "Remember the lesson: 'An idea or a fact is not worth more merely because it is easily available to you.'" (Charles T. Munger)

Whenever someone struggles with finding a good topic to write about, someone else will recommend brainstorming. It still has a modern sound to it, even though it was described in 1919 by Alex Osborn and introduced to a broader audience in 1958 in the book "Brainstorming: The Dynamic New

Way to Create Successful Ideas" from Charles Hutchison Clark. For many people, it is still the best method to generate new ideas. I suggest to see it rather as an expression of an outdated fixation on the brain, which is mirrored in the fixation of our educational system to learn things by heart – which means to think without external tools. Testing students for memorised knowledge does not give much indication about their understanding, and the fact that someone came up with a lot of ideas during a brainstorming session does not give much indication about their quality.

While we want to find topics that are important, interesting and can be dealt with using the material we have available, the brain prioritises ideas that are *easily* available in the moment. This, obviously, does not equal relevant. The brain more easily remembers information that it encountered recently, which has emotions attached to it and is lively, concrete or specific. Ideally, it rhymes as well (cf. Schacter, 2001; Schacter, Chiao and Mitchell, 2003). Everything that is rather abstract, vague, emotionally neutral or does not even sound good is far down on its list of priorities – not exactly the best criteria for an intellectual endeavour.

It makes things worse that we tend to like our first ideas the best and are very reluctant to let go of them, irrespective of their actual relevance (Strack and Mussweiler 1997). And before you now wonder if it would be a good idea to overcome the limitations of brainstorming by assembling a group of friends to brainstorm together, forget it: More people in a brainstorming group usually come up with *less* good ideas and restrict themselves inadvertently to a narrower range of topics (Mullen, Johnson, and Salas 1991).[38]

But finding the right topic to write about is mostly a problem for those who treated writing as a separate task from others, anyway – not for those of us who work with the slip-box. Those who rely on their brains will first ask themselves, then their supervisor: I read so much, but what should I write about? On the other hand, we who have already accompanied our studies by writing and collecting notes in a smart way simply don't have the need for brainstorming anymore. We can just look into our slip-box instead. If we had a good idea before (and it is certainly more likely that we will come up with a good idea over the course of several months rather than within a couple of minutes), it will be in there. It might even already have proved itself worthy

of following up on, in which case it is already connected to supporting material. It is so much easier to see what worked than to predict what might work.

We don't need to worry about the question of what to write about because we have answered the question already – many times on a daily basis. Every time we read something, we make a decision on what is worth writing down and what is not. Every time we make a permanent note, we also made a decision about the aspects of a text we regarded as relevant for our longer-term thinking and relevant for the development of our ideas. We constantly make explicit how ideas and information connect with each other and turn them into literal connections between our notes. By doing this, we develop visible clusters of ideas that are now ready to be turned into manuscripts.

The process is self-reinforcing. A visibly developed cluster attracts more ideas and provides more possible connections, which in return influence our choices on what to read and think further. They become signposts for our daily work and orient us to what is worth thinking about. Topics grow bottom up and gain traction along the way. As soon as the slip-box has grown a bit, we can replace our *thoughts* on what is interesting and what we *think* is relevant with a pragmatic *look* into the slip-box, where we can plainly see what truly proved to be interesting and where we found material to work with.

It is the one decision in the beginning, to make writing the mean and the end of the whole intellectual endeavour, that changed the role of topic-finding completely. It is now less about finding a topic to write about and more about working on the questions we generated *by* writing.

By generating questions in the course of our everyday work, we bring the law of large numbers on our side. The truth is that few questions are suitable to be answered within an article, a thesis or a book. Some are too broad, some are too narrow, some are impossible to answer with knowledge we can reasonably acquire, but for most, we just don't have the material to work with. Those who start with a plan and an idea about what to write will probably encounter that truth somewhere along the way. They then might be able to correct an unfortunate choice once or twice, but will have to stick with what they have chosen at one point, otherwise they will never finish their project.

If we, on the other hand, let questions arise from the slip-box, we know

that they are tried and tested among dozens or even hundreds of other possible questions. The vast majority of questions might have been answered quickly or disappeared as no notes were drawn to them, either because of a lack of interest or a lack of material. This is how evolution works: by trial and error, not planning.

Good questions are in the sweet spot of being relevant and interesting, not too easy to answer but possible to tackle with material that is available or at least within our reach. When it comes to finding good questions, it is therefore not enough to *think* about it. We have to *do* something with an idea before we know enough about it to make a good judgement. We have to work, write, connect, differentiate, complement and elaborate on questions – but this is what we do when we take smart notes.

13.2 From Top Down to Bottom Up

Developing topics and questions from what we have has a huge advantage. The ideas we decide on are not taken out of thin air, but are already embedded in a content-rich context and come with material that we can use. Starting with what we have also comes with another, unexpected advantage: We become more open to new ideas.

It seems counterintuitive that we become more open to new ideas the more familiar we are with ideas we have already encountered, but historians of science will happily confirm this (Rheinberger 1997). It makes sense when you think about it: without intense elaboration on what we already know, we would have trouble seeing its limitations, what is missing or possibly wrong. Being intimately familiar with something enables us to be playful with it, to modify it, to spot new and different ideas without running the risk of merely repeating old ideas *believing* they are new. This is why it feels in the beginning that familiarity makes it harder to come up with new ideas. We just didn't know that most of the ideas we had are actually not that innovative. But while the belief in our own ingenuity decreases with expertise, we become more able to actually make a genuine new contribution.

Jacob Warren Getzels and Mihaly Csikszentmihalyi showed that this is also true in art: New, groundbreaking work is rarely created on a whim by some accidental artist who believes himself to be amazingly innovative. On the contrary: The more time an artist devotes to learning about an aesthetic "problem," the more unexpected and creative his solution will be regarded

later by art experts (Getzels and Csikszentmihalyi 1976).

If open-mindedness is all that is needed, the best artists and scientists were hobbyists. Jeremy Dean, who has written extensively on routines and rituals and suggests seeing old ways of thinking as thinking routines, puts it well when he writes that we cannot break with a certain way of thinking if we are not even aware that it is a *certain* way of thinking (Dean, 2013).

13.3 Getting Things Done by Following Your Interests

It is not surprising that motivation is shown to be one of the most important indicators for successful students – next to the feeling of being in control of one's own learning course. When even highly intelligent students fail in their studies, it's most often because they cease to see the meaning in what they were supposed to learn (cf. Balduf 2009), are unable to make a connection to their personal goals (Glynn et al. 2009) or lack the ability to control their own studies autonomously and on their own terms (Reeve and Jan, 2006; Reeve, 2009).

These findings are an important argument for academic freedom. Nothing motivates us more than seeing a project we can identify with moving forward, and nothing is more demotivating than being stuck with a project that doesn't seem to be worth doing.

The risk of losing interest in what we do is high when we decide upfront on a long-term project without much clue about what to expect. We can mitigate this risk considerably by applying a flexible organisation scheme that allows us to change course whenever necessary.

If we accompany every step of our work with the question, "What is interesting about this?" and everything we read with the question, "What is so relevant about this that it is worth noting down?" we do not just choose information according to our interest. By elaborating on what we encounter, we also discover aspects we didn't know anything about before and therefore develop our interests along the way. It would be quite sad if we did *not* change our interests during research.

The ability to change the direction of our work opportunistically is a form of control that is completely different from the attempt to control the circumstances by clinging to a plan. The beginning of the research project that led to the discovery of DNA's structure was the application for a grant. The grant was not to discover DNA's structure, but find a treatment for

cancer. If the scientists had stuck to their promises, not only would they probably not have found a cure for cancer, but they definitely would not have discovered the structure of DNA. Most likely, they would have lost interest in their work. Luckily, they did not stick to their plan, but followed their intuition and interest and took the most promising path to insight whenever one opened up. The actual research program developed along the way (Rheinberger 1997). One could say they finished the plan on what to do the very moment they finished the whole project.

The ability to keep control over our work and change course if necessary is made possible by the fact that the big task of "writing a text" is broken down into small, concrete tasks, which allows us practically to do exactly what is needed at a certain time and take the next step from there. It is not just about feeling in control, it is about setting up the work in a way that we really are in control. And the more control we have to steer our work towards what we consider interesting and relevant, the less willpower we have to put into getting things done. Only then can work itself become the source of motivation, which is crucial to make it sustainable.

> "When people experienced a sense of autonomy with regard to the choice, their energy for subsequent tasks was not diminished. An important question that deserved empirical attention concerns the potential for autonomous choice to vitalise or enhance self-regulatory strength for subsequent tasks. What, for example, are the conditions that will lead autonomous choice to enhance people's motivation for new tasks? We suggest that among the factors that are likely to affect whether choice will be vitalizing is the nature of the options being provided to the person. If a person is offered choice among options that he or she does not value, that are trivial or irrelevant, the choice is unlikely to be vitalizing and may be depleting, even if there is no subtle pressure toward a particular option. On the other hand, having autonomous choice among options that do have personal value may indeed be quite energizing." (Moller, 2006, 1034)

Organizing the work so we can steer our projects in the most promising direction not only allows us to stay focused for longer, but also to have more fun – and that is a fact (Gilbert 2006).[39]

13.4 Finishing and Review

There is not much left to say about the last two steps because the main work is already done.

A key point: Structure the text and keep it flexible. While the slip-box was very much about experimenting with and generating new ideas, we now need

to bring our thoughts into a linear order. The key is to structure the draft *visibly*. It is not so much about deciding once and for all what to write in which chapter or paragraph, but what does *not* need to be written in a particular part of the manuscript. By looking at the (always preliminary) structure, you can see if information will be mentioned in another part.

The problem in this stage is almost exactly the opposite of the "blank screen." Instead of not knowing how to fill the pages, we have so much at hand that we have to curb our impulse to mention everything at the same time.

The desktop function of the Zettelkasten is the place to sort your notes for a particular project. It helps with developing a rough structure, but it also allows you to keep it flexible. The structure of an argument is part of it and therefore will change during the process of developing it – it is not a vessel to be filled with content. As soon as the structure not longer changes much, we can happily call it a "table of contents." But even then, it helps to see it as a structural guideline and not a prescription. It is not unusual to change the order of chapters at the very end.

Another key point: Try working on different manuscripts at the same time. While the slip-box is already helpful to get one project done, its real strength comes into play when we start working on multiple projects at the same time. The slip-box is in some way what the chemical industry calls "verbund." This is a setup in which the inevitable by-product of one production line becomes the resource for another, which again produces by-products that can be used in other processes and so on, until a network of production lines becomes so efficiently intertwined that there is no chance of an isolated factory competing with it anymore.[40]

The process of reading and writing inevitably produces a lot of unintended by-products. Not all ideas can fit into the same article, and only a fraction of the information we encounter is useful for one particular project.

If we read something that is interesting, but not directly relevant to our current project, we can still use it for another project we are working on or might work on. Everything that enriches our slip-box has the potential to end up in a text we might write. By taking smart notes, we collect en passant the material for our future writings in one place. The projects we work on can be in completely different stages of completion. Some of them might not even

have come to our attention. This is advantageous not only because we make progress on the next papers or books while we are still working on the current one, but also because it allows us to switch to other projects whenever we get stuck or bored.

Remember: Luhmann's answer to the question of how one person could be so productive was that he never forced himself to do anything and only did what came easily to him. "When I am stuck for one moment, I leave it and do something else." When he was asked what else he did when he was stuck, his answer was: "Well, writing other books. I always work on different manuscripts at the same time. With this method, to work on different things simultaneously, I never encounter any mental blockages." (Luhmann, Baecker, and Stanitzek 1987, 125–55) It is like martial arts: If you encounter resistance or an opposing force, you should not push against it, but redirect it towards another productive goal. The slip-box will always provide you with multiple possibilities.

13.5 Becoming an Expert by Giving up Planning

One inconvenient truth in the end: The planning skills of students are pathetic.

The psychologists Roger Buehler, Dale Griffin and Michael Ross asked a group of students to:

1. Estimate realistically the time they would need to finish a paper.
2. Estimate additionally how long they think they would need
   a. if everything goes as smoothly as possible or
   b. if everything that could go wrong would go wrong.

Interestingly, the majority of the student's "realistic" estimates were not so different from their estimates for writing under perfect conditions. This alone should have given them pause for thought. But when the researchers checked how much time the students really needed, it was much, much longer than they estimated. Not even half of the students managed to finish their papers in the time they thought they would need under the *worst* possible conditions (Buehler, Griffin and Ross 1994). The researchers did not assume that half of the students suddenly faced calamities beyond their imagination.

In another study a year later, the psychologists looked more closely at this

phenomenon, which still puzzled them because the students could have answered any way they liked – there was no benefit in giving overly optimistic answers. They asked the students to give them time ranges in which they were either 50%, 70% or 99% sure to finish their paper.

Again: They were free to give *any* answer. But, sure enough, only 45% managed to get their papers done within the time they were sure they had a 99% likelihood to finish it under any condition they regarded as possible (Buehler, Griffin, and Ross 1995). Now, you might think it would make a difference to remind them about their not-so-perfect guesses last time. The researchers thought so, but the students proved them wrong: Experience doesn't seem to teach students anything.

But there is one consolation: It has nothing to do with being a student. It has something to do with being human. Even the people who study this phenomenon, which is called the overconfidence bias, admit that they too fall for it (Kahneman 2013, 245ff).

The lesson to draw is to be generally sceptical about planning, especially if it is merely focused on the outcome, not on the actual work and the steps required to achieve a goal. While it doesn't help to imagine oneself the great author of a successful and timely finished paper, it does make a difference if we have a realistic idea about what needs to be done to get there in our minds. We know from sports that it doesn't help when athletes imagine themselves as winners of a race, but it makes a big difference if they imagine all the training that is necessary to be able to win. Having a more realistic idea in mind not only helps them to perform better, it also boosts their motivation (Singer et al. 2001). We know today that this is not only true for athletes, but for any work that needs effort and endurance (Pham and Taylor 1999). Writing definitely belongs in this category.

The other lesson is not that we can't learn from our experiences, but that we can only learn from our experiences if feedback follows shortly afterwards – and maybe more than once in a while. Disassembling the big challenge of "writing a paper" into small, manageable tasks helps to set realistic goals that can be checked on a regular basis. If someone starts from the unrealistic assumption that a paper can be written by following a linear plan of finding a topic first, doing literature research second, followed by separable stages of reading, thinking, writing and proof-reading, then it is no surprise that any time planning that is based on this assumption will be

unrealistic as well. Once we do some research, we may discover that our initial idea was not as good as we thought; once we read something, it is likely that we will discover something else to read, because that is how we discover literature; once we start writing down our arguments, it is likely that we will realise that we need to take something else into account, change our initial ideas or go back to an article we might not have understood well enough. None of this is unusual, but all of this will mess up any grand plans.

If we instead set out to write, say, three notes on a specific day, review one paragraph we wrote the day before or check all the literature we discovered in an article, we know exactly at the end of the day what we were able to accomplish and can adjust our expectations for the next day. Getting hundreds of these cases of feedback over the course of a year will make us much more likely to learn from them and to become more realistic about our productivity than if we just miss a deadline once in a while, which, of course, will not happen again – until next time.

The problem with the linear model is not just that one phase might need longer than planned, but that it is highly unlikely that we will finish a phase sooner than planned. If the whole problem was just an error in judgement, we would on average overestimate the time we need as often as we underestimate it, but unfortunately, that is not how it works. According to the famous law of Parkinson, every kind of work tends to fill the time we set aside for it, like air fills every corner of a room (Parkinson 1957).

While this is almost a universal law for longer time frames, the opposite is true for tasks that can be completed in one go. This is partly due to the aforementioned Zeigarnik effect (Zeigarnik 1927), in which our brains tend to stay occupied with a task until it is accomplished (or written down). If we have the finish line in sight, we tend to speed up, as everyone knows who has ever run a marathon. That means that the most important step is to get started. Rituals help, too (Currey 2013).

But the biggest difference lies in the task you are facing to start with. It is much easier to get started if the next step is as feasible as “writing a note,” “collect what is interesting in this paper” or “turning this series of notes into a paragraph” than if we decide to spend the next days with a vague and ill-defined task like “keep working on that overdue paper.”

13.6 The Actual Writing

Ernest Hemingway was once asked how often he rewrote his first draft.

His answer: “It depends. I rewrote the ending of ‘A Farewell to Arms,’ the last page of it, thirty-nine times before I was satisfied.”

“Was there some technical problem there? What was it that had stumped you?” the interviewer asked.

“Getting the words right,” Hemingway replied (Paris Review, 1956).

If there is one piece of advice that is worth giving, it is to keep in mind that the first draft is only the first draft. Slavoj Žižek said in an interview[41] that he wouldn’t be able to write a single sentence if he didn’t start by convincing himself he was only writing down some ideas for himself, and that maybe he could turn it into something publishable later. By the time he stopped writing, he was always surprised to find that the only thing left to do was revise the draft he already had.

One of the most difficult tasks is to rigorously delete what has no function within an argument – “kill your darlings.”[42] This becomes much easier when you move the questionable passages into another document and tell yourself you might use them later. For every document I write, I have another called “xy-rest.doc,” and every single time I cut something, I copy it into the other document, convincing myself that I will later look through it and add it back where it might fit. Of course, it never happens – but it still works. Others who know a thing or two about psychology do the same (cf. Thaler, 2015, 81f).

14 Make It a Habit

> "It is a profoundly erroneous truism, repeated by all copybooks and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them." (Whitehead)[43]

The most reliable predictor of our behaviour in the immediate future is – surprise, surprise – the intention to do it. If we decide to go to the gym now, the chance is that we really do go to the gym now. But this is, unfortunately, only true for the very immediate future. When it comes to the long run, researchers struggle to find any measurable connection between our intentions and our actual behaviour (Ji and Wood 2007; Neal et al. 2012). There is one exception, though: we most certainly act according to our intention if we happen to intend to do exactly what we used to do before.

It is really easy to predict the behaviour of people in the long run. In all likelihood, we will do in a month, a year or two years from now exactly what we have done before: eat as many chocolates as before, go to the gym as often as before, and get ourselves into the same kinds of arguments with our partners as before. To put it differently, good intentions don't last very long, usually.

We have the best chance to change our behaviour over the long term if we start with a realistic idea about the difficulties of behavioural change (Dean 2013). And that is not so easy, because the more we are used to doing something in a particular way, the more in control we feel about it, even though we are less in control of it. (This is in part also due to the aforementioned mere-exposure error.)

> "Those with the strongest habits who were the least successful in predicting their behaviour over the coming week were the most confident in their predictions. The finding is striking because it hints at one of the dark sides of habits. When we perform an action repeatedly, its familiarity seems to bleed back into our judgments about that behavior. We end up feeling we have more control over precisely the behaviours that, in reality, we have the least control over. It's another example of our thought processes working in the opposite way to our intuitive expectations." (Dean 2013, 22)

The trick is not to try to break with old habits and also not to use willpower to force oneself to do something else, but to strategically build up new habits

that have a chance to replace the old ones. The goal here is to get into the habit of fetching pen and paper whenever we read something, to write down the most important and interesting aspects. If we manage to establish a routine in this first step, it becomes much easier to develop the urge to turn these findings into permanent notes and connect them with other notes in the slip-box. It is not so difficult to get used to thinking within an external memory of notes, as the advantages become obvious quite quickly. As soon as we have developed a new routine, we can do what intuitively feels right, which requires no effort. Watching others reading books and doing nothing other than underlining some sentences or making unsystematic notes that will end up nowhere will soon be a painful sight.

AFTERWORD

The Take Smart Notes principle works. Many successful writers, artists and academics use some form of a slip-box. This book is also written with the help of the slip-box. It was, for example, a note on “technology, acceptance problems” that pointed out to me that an answer to the question why some people struggle to implement the slip-box could be found in a book on the history of the shipping container. I certainly would not have looked for that intentionally – doing research for a book on effective writing! This is just one of many ideas and connections the slip-box pointed out to me. That it is not just a tool to write more efficiently, but also a training device for serious long-term learning, should have been obvious to me, but wasn’t. Only when I was taking smart notes on more recent learning experiments did it dawn on me that I am in the middle of putting exactly into practice what is proven to work best. I want to point out, though, that I sometimes have ideas all by myself.

The particular technique presented in this book enabled Niklas Luhmann to become one of the most productive and innovative social theorists of the last century. There are increasing numbers of academics and nonfiction writers taking notice.[44] But it is still not an easy sell for the majority of students and writers. There are different reasons for this. First of all, the long-term, cross-topic organization of notes, which is guided only by one’s own understanding and interest, is very much at odds with the modular, compartmentalised and top-down approach in which the curricula of universities and colleges are organised. Teaching is still set up for review, and students are not really encouraged to independently build a network of connections between heterogeneous information – despite the radical change in our understanding on how our memory and learning works. There is a lot of talk about innovative approaches. But without changing the actual workflow, this talk is idle. Some seemingly innovative ideas, like the “learner-centred” approach, often do more harm than good, as they still neglect the need for an external scaffolding to think in. It is not the learner who should be the focus of attention.

The slip-box does not put the learner in the centre. Quite the contrary: It allows the learner to let his or her own thinking become decentralised within a network of other ideas. Learning, thinking and writing should not be about accumulating knowledge, but about becoming a different person with a different way of thinking. This is done by questioning one's own thinking routines in the light of new experiences and facts.

The prevalence of linear and learner-centred approaches also lead to the common misunderstanding about the use of the slip-box as a tool that can be used without changing the work routines around it. It is then often used simply as an archive where you just take out what you put in earlier. This, of course, will lead to disappointment. If we are just storing information, there would be no need to use a slip-box. To reap its benefits, we need to change our working routines. And the basis for that is a deep understanding on how and why it works and how the different steps and tasks of writing fit together. This is why a book, not just a manual, is needed to explain the principle and ideas behind it.

Another reason why this technique is still a hard sell is that most students only realise the need for a good system when they already struggling with their writing, typically towards the end of the university program, when a bachelor's, master's or doctoral thesis needs to be written. It certainly still helps, but it would have helped much more if one started earlier – very much like saving for retirement. It is also difficult to change behaviour in times of stress. The more pressure we feel, the more we tend to stick to our old routines – even when these routines caused the problems and the stress in the first place. This is known as the tunnel effect (Mullainathan and Shafir 2013). But Mullainathan and Shafir, who examined this phenomenon thoroughly, also found a way out of it: Change is possible when the solution appears to be simple.

And that is the very good news at the end. The slip-box is as simple as it gets. Read with a pen in your hand, take smart notes and make connections between them. Ideas will come by themselves and your writing will develop from there. There is no need to start from scratch. Keep doing what you would do anyway: Read, think, write. Just take smart notes along the way.

If you want to kick-start your new note-taking efforts with a one-on-one coaching session or would like some help clarifying your thoughts on a piece you are writing, check out my offers on http://takesmartnotes.com

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INDEX

Introduction
1 Everything You Need to Know
1.1 Good Solutions are Simple – and Unexpected
1.2 The Slip-box
1.3 The slip-box manual
2 Everything You Need to Do
2.1 Writing a paper step by step
3 Everything You Need to Have
3.1 The Tool Box
4 A Few Things to Keep in Mind
The Four Underlying Principles
5 Writing Is the Only Thing That Matters
6 Simplicity Is Paramount
7 Nobody Ever Starts From Scratch
8 Let the Work Carry You Forward
The Six Steps to Successful Writing
9 Separate and Interlocking Tasks
9.1 Give Each Task Your Undivided Attention
9.2 Multitasking is not a good idea
9.3 Give Each Task the Right Kind of Attention
9.4 Become an Expert Instead of a Planner
9.5 Get Closure
9.6 Reduce the Number of Decisions

10 Read for Understanding
10.1 Read With a Pen in Hand
10.2 Keep an Open Mind
10.3 Get the Gist
10.4 Learn to Read
10.5 Learn by Reading
11 Take Smart Notes
11.1 Make a Career One Note at a Time
11.2 Think Outside the Brain
11.3 Learn by not Trying
11.4 Adding Permanent Notes to the Slip-Box
12 Develop Ideas
12.1 Develop Topics
12.2 Make Smart Connections
12.3 Compare, Correct and Differentiate
12.4 Assemble a Toolbox for Thinking
12.5 Use the Slip-Box as a Creativity Machine
12.6 Think Inside the Box
12.7 Facilitate Creativity through Restrictions
13 Share Your Insight
13.1 From Brainstorming to Slip-box-Storming
13.2 From Top Down to Bottom Up
13.3 Getting Things Done by Following Your Interests
13.4 Finishing and Review
13.5 Becoming an Expert by Giving up Planning
13.6 The Actual Writing

14 Make It a Habit
Afterword
Bibliography
Index

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[1] Cf. for example the writing guide of the University of Toronto: http://www.writing.utoronto.ca/advice

[2] The research on willpower or "ego depletion" is in a bit of turmoil at the moment. But it is safe to say that using willpower is a terrible strategy to get things done in the long run. For an overview: https://replicationindex.wordpress.com/2016/04/18/is-replicability-report-ego-depletionreplicability-report-of-165-ego-depletion-articles/

[3] The introduction to his theory was published in 1987 in the form of a book with the title "Social Systems" and the book series number "666." Those who were not aware of his note-taking system might have been tempted to think that this was not by chance, as his productivity could only have been explained by a deal with the devil.

[4] https://youtu.be/qRSCKSPMuDc?t=37m30s (all links are on takesmartnotes.com)

[5] On the back of his notes, you will find not only manuscript drafts, but also old bills or drawings by his children.

[6] In the program Zettelkasten, the desktop is where you can bring notes into project-specific order. Each project should have its own desktop. If you use pen and paper, use your actual desktop.

[7] This problem is known as Meno's paradox (Plato, Meno 80e, Grube translation).

[8] SQ3R is the acronym for "Survey, Question, Read, Recite, Review," developed by psychology professor Francis Pleasant Robinson for the U.S. Army during World War II (Robinson, 1978).

[9] SQ4R, "Survey, Question, Read, Reflect, Recite, Review" will most certainly be replaced soon by SQ5R – whatever that will stand for.

[10] While there are no official apps for smartphones available at the moment, there are multiple third-party solutions for both Android and iOS.

[11] Google Monty Python "How to Play the Flute".

[12] Unfortunately most of it is in German: http://www.uni-bielefeld.de/soz/luhmann-archiv/

[13] Whenever no published English version of a German text is available, the translation is by myself.

[14] Guide to Academic Writing, English and American Studies, University of Bayreuth.

[15] Writing and Style Guide for University Papers and Assignments, First version prepared by François-Pierre Gingras (1998), School of Political Studies, Faculty of Social Sciences, University of Ottawa.

[16] And, of course, it is addressing the "fear of the blank page" (Kruse 2005).

[17] Ryfe and Kemmelmeier not only show that this development goes much further back into the past and first appeared in newspapers (the quotes of politicians got almost halved between 1892 and 1968), but also posed the question if this can maybe also be seen as a form of increased professionalism of the media as they do not just let politicians talk as they wish (Ryfe and

Kemmelmeier 2011). Craig Fehrman also pointed out the irony in the reception of this rather nuanced study – it was itself reduced to a soundbite in the media (Fehrman 2011).

[18] As much as Csikszentmihalyi's concept of flow became part of everyday language, it was never thoroughly examined. In the 1960's, some studies in the Soviet Union focused on "postvoluntary attention," which basically means the same thing – an attention without effort that is neither involuntary nor voluntary. But almost all of the study results are only available in Russian and never found their way into the international psychological discourse. (Cf. Bruya 2010, 4 with reference to Dobrynin 1966).

[19] Flyvbjerg describes this experiment and example not only with reference to the book of Dreyfus and Dreyfus, but also with reference to extensive talks with them. I therefore stick with the description in Flyvbjerg 2001.

[20] This is even true for highly specialised surgeons (Gawande 2002).

[21] Here 11 95 82 19 62 31 96 64 19 70 51 97 4 becomes 1. 1958 2. 1962 3. 1966 4. 1970 5. 1974

[22] It is almost impossible to overstate the importance of taking care of the little things. Not only are we easily distracted by mundane thoughts, we also routinely forget small but important things when we don't externalise them. This is why checklists are so important wherever something serious is at stake (cf. Gawande 2010).

[23] Even though this is not a new discovery, it is now confirmed by neuroscientists and experimental psychologists alike (Doyle and Zakrajsek 2013 ref. Tambini, A., Ketz, N., and Davachi, L. 2010).

[24] Neuroscientists would call it long-term potentiation (Bliss, Collingridge, and Morris 2004).

[25] There is plenty of proof that sleeping aids in memorization (cf. for example Wagner et al. 2004) and can help to find solutions to problems (Wamsley et al. 2010).

[26] Franklin 1840, 250.

[27] Here is an example: http://ds.ub.uni-bielefeld.de/viewer/
toc/ZK_digital/1/#LOG_0000

[28] Cf. Wolfe and Britt, 2008.

[29] They claim this quote is from (Jang et al. 2012), but I couldn't find it there. Anyway: It is a good way to put it.

[30] According to different personal encounters.

[31] About $30,000 adjusted for inflation.

[32] About $200,000 if you take the 7% the S&P500 achieved historically adjusted for inflation.

[33] "Genius: The Life And Science of Richard Feynman," James Gleick, Pantheon Books, 1992 (see pg. 409).

[34] Just for fun, check a few references in the aforementioned book from Doyle and Zakrajsek. I bet you won't have to search long to find surprising results (Doyle and Zakrajsek 2013).

[35] You are less prone to make this error in judgement if you know about it (Rassin 2014). You are welcome.

[36] An exception might be the author of my favourite TripAdvisor review. He wrote of a museum I visited (and enjoyed): "There's really not much to see in this museum. Just several buildings with paintings hanging on the walls." (Google: User Ondska Museum Puri Lukisan)

[37] http://longform.org/posts/longform-podcast-152-carol-loomis

[38] You can avoid that, though, by letting all members brainstorm for themselves and compiling the results afterwards.

[39] If that doesn't convince you, then maybe the fact that the feeling of being in control lengthens your life (Langer and Rodin 1976; Rodin and Langer 1977). That is equally as well understood as the opposite: The loss of control has a negative effect on your health (M. G. Marmot et al. 1997). As a short overview, cf. Michael G. Marmot 2006.

[40] The first and most developed “verbund” is located in Ludwigshafen, Germany. It belongs to BASF, the world’s biggest chemical company and one of the most consistently profitable, despite being located in a highly developed country with high wages and social security costs.

[41] In the movie Žižek! (USA 2005; Astra Taylor).

[42] The quote is variably attributed to William Faulkner, Allen Ginsberg, Oscar Wilde, Stephen King and others. It seems that the critic Arthur Quiller-Couch mentioned it first when he told his students at Cambridge in 1914: “If you here require a practical rule of me, I will present you with this: Whenever you feel an impulse to perpetrate a piece of exceptionally fine writing, obey it—wholeheartedly—and delete it before sending your manuscript to press. Murder your darlings.” (Quiller-Couch 2006, 203)

[43] Alfred North Whitehead, 1911, 61.

[44] Cf. the discussions in the forum for the program zettelkasten.de