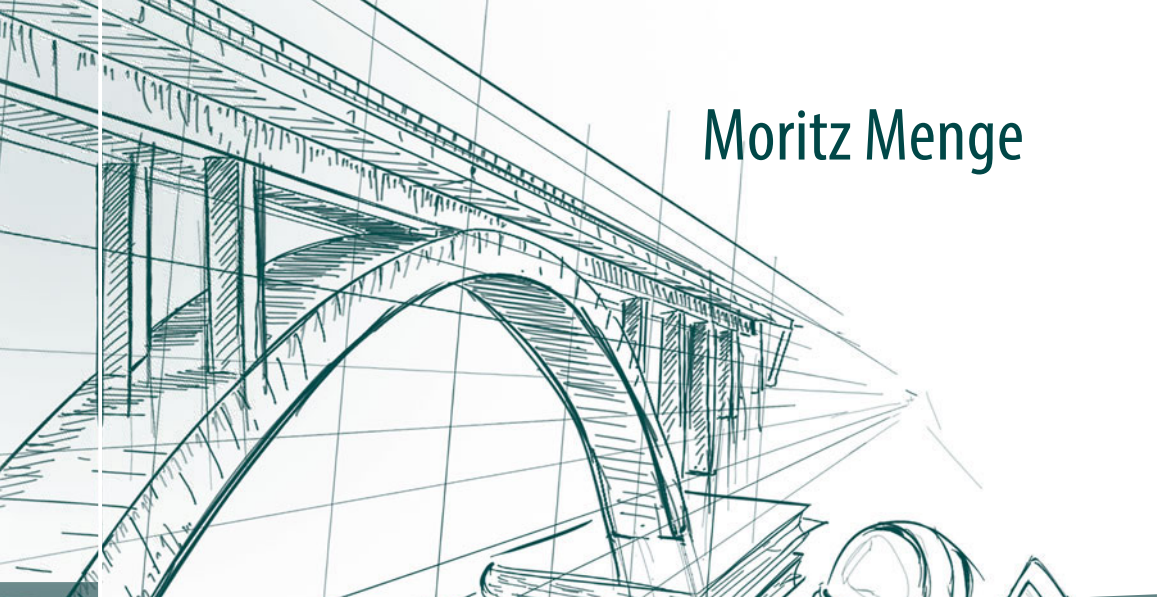

Moritz Menge

Building Bridges Starts in the Mind

Engineering— More than Technical Solutions

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Preface

"Prepare yourself for the fact that as a civil engineer, you will only be taken seriously after 10 years of experience!" I heard this sentence at the beginning of my professional life. It irritated and unsettled me at the time. However, I could indeed clearly feel over the first few years what it is like to be taken a little more "seriously". Surprisingly, this was independent of the technical context. Today—after almost 20 years as a civil engineer—I know firstly, that this prophecy indeed has some truth to it, and secondly, that it actually takes a few years for all young civil engineers to be allowed to discuss on an equal footing with the experienced ones—regardless of their self-confidence, intelligence or empathy.

Today, I am right in the middle of being an engineer.

This means that my opinion as an engineer is heard and valued. Even when I have to move on a (professional) terrain that is unfamiliar to me, if necessary.

So, I am right in the middle of being an engineer.

Although I am neither a widely known civil engineer, nor have I studied sociology or psychology. I am not self-employed in my profession. I have been working for many years as a bridge engineer, employed in an infrastructure planning office, where I also have responsibility in

leadership and management. However, I claim that only my employment is referred to as "dependent employment". I myself feel highly independent and above all free in my thoughts about my profession itself and about my professional everyday life in particular.

These thoughts beyond everyday life are my motivation to write them down. Partly, the viewpoints reflect my work, partly they describe my ideal of the engineering profession.

Many thoughts relate to the civil engineer, partly even more specifically to the special work experiences of a structural engineer. However, I am sure that some things can be transferred to other engineering areas.

But for me, the primary perspective remains that of a bridge engineer.

Furthermore, I will raise questions that philosophers, other humanities scholars, or sociologists have long addressed or could address in order to receive nuanced answers. Nevertheless, I describe my thoughts and also my positioning purely from the perspective of the active engineer, not the theorist.

Therefore, my observations from practice or idealized images of my professional environment do not make any scientific claim.

Some contexts that I approach are controversial among humanities scholars. I adopt what I can understand well and what makes sense to me as a basis for my further considerations, even if these have a partly hypothetical character, perhaps they are ideal images that I strive for.

I deliberately use stereotypes. Of course, I know what brilliant engineering individuals there are; professionally, personally—I have already met some. But many stereotypical simplifications also apply to numerous engineers that I regularly encounter.

I forego gender-neutral phrasing in favor of readability for the readers. Especially since I have experienced that the majority of female engineers do not place particular importance on gender-neutral phrasing, but rather on the sincerity of statements. Thus, in this book, both genders are always implied when referring to groups such as "engineers".

My special thanks for the creation of these transcripts go to my wife Ruth, who is also a civil engineer with her own specific experiences. She has "chewed over" many of the following thoughts with me in countless

conversations after our respective workdays, thus consolidating them and shaping their supporting structure.

I would also like to thank another engineer who is also a social scientist: My father, who has always highly reflected on life, has always critically questioned my statements, just like my mother has.

Finally, I would also like to thank my employer. Without the appreciative and supportive environment that I have been experiencing and helping to shape for years, my view of our profession in this way would hardly be possible. This requires freedoms in professional activity and a modern employer.

Dear reader,
I hope that the present chapters stimulate discussion, and I look forward to exciting conversations.

Such conversations help all engineers who reflect on their professional everyday life.

"Doing" is our primary task as civil engineers—but thinking about it: This seems to me no less important, because bridge construction begins in the mind.

Linz, Austria Moritz Menge

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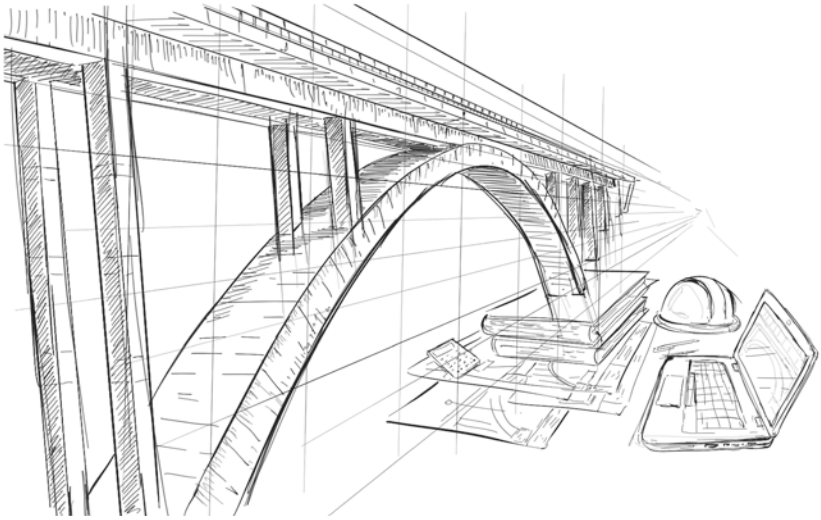
Introduction



"Marriage is a bridge that must be built anew every day." A saying on a greeting card. From the perspective of a bridge engineer, this thought is quite questionable, if not absurd.

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A bridge that he constantly has to rebuild? That collapses daily? You don't have to congratulate this engineer!

I prefer a permanently load-bearing bridge that enables a path between points that would otherwise be difficult to reach.

For me, bridge building begins in the mind—both technical bridge building and social.

There are many topics that tickle me. Some of what moves me—daily or repeatedly—I have written down.

And there are other topics that also occupy me.

A complete collection is not to be expected, because being an engineer is so much more than perfect technology.

The chapters range from the general working environment of the engineer to specific topics of a structural planner to points of contact with other professions.

The main approach is one of an interdisciplinary perspective. Out of the purely technology-related engineering—into a holistic understanding of engineering, in which the perspectives of other disciplines are (to some extent) to be considered.

Engineering with Serenity

Working as an engineer in a team is a lot of fun. Especially when you can develop a certain serenity towards your colleagues and thus work more *with* them than in competition with them.

Engineers and Their Responsibility

We engineers have a lot of responsibility in many ways. Being aware of this from time to time shows us the size of our tasks, but also the purpose of our activity—whether meaningful or less meaningful. It should be questioned.

Engineers and Their Drawer

An engineer usually cannot conjure up ready-made solutions from the drawer. But a tidy drawer in which he sorts his tools and experiences is something every engineer has—or should have. It helps him a lot.

Engineers in the Change of Digitization
We live in a time when digitization and its rapid progress also shape large parts of our professional lives. Here we have to keep up in order to make the best possible use of the additional and new opportunities, but we must not neglect our technical knowledge.

Professional Everyday Life—Engineers in Construction and Planning Projects
Many engineers take on the responsibility for leading projects after a time characterized by technical work. The activity of a project manager is quite different from that of a technical expert, even if they overlap.

Engineers as Leaders
The growth of companies leads not a few engineers into leadership positions. There they do things they initially did not learn. This creates the danger that they hide behind the technology and do not lead as they should.

Engineers and Their Error Management
Although we don't like to make mistakes, we do make them, but we don't like to admit them to others or ourselves. However, dealing openly with mistakes at an early stage promotes personal development, the progress of technology, and usually also economic success.

Statics Does Not Tolerate Haste
Haste when setting up static calculations is a great danger that is often underestimated. Every engineer must develop strategies here to plan safe structures despite sometimes unavoidable haste.

The "Psyche" of Statics
The static calculations of civil engineers are planning components that are very important in the area of structural planning. Nevertheless, one must always be aware that they are only a means to an end.

Civil Engineers and Their Role in Climate Change
Climate change will change our lives. Many talk about small individual measures and the very large factors, such as how climate change could be slowed down. In between, every single civil engineer has levers available to make a contribution that is larger than his personal footprint. But there is far too little education on how these levers can work.

Engineers and Politicians
Politicians are a type of their own, so it is said. We engineers too. But there are more similarities than appear at first glance. This realization can help engineers in their cooperation with politicians.

Engineers and Lawyers in the Construction and Planning Process
Lawyers think differently than engineers. Therefore, they are sometimes foreign to us engineers, and in many ways superior. When they argue on the opposing side, our respect can even turn into aversion. However, we engineers have the responsibility of whether and with what mandate we involve lawyers in problem-solving.

Engineers and Sales
"Sales have no idea about the product!", is a phrase often heard in the industry. In engineering companies, this is less often the case, as the engineer usually sells his product himself. But he is rarely a born salesman of his work. However, he should become one. Who else? After all, he knows his work best.

Engineers and (their) Children
Children are explorers and problem solvers. So are engineers. Seeing the world together can be fascinating. We can pass on a lot to children, especially when we understand how children learn. And then we also learn from them.

All chapters are structured in such a way that they are independent and can be read individually.

Enjoy browsing!

2

Being an Engineer with Serenity

Precision, concentration, even genius—these are often associated with engineers. Serenity is rarely mentioned, yet it is precisely this that makes a complete engineer.

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This also has something to do with growing older. But not everyone who grows older becomes more serene, and inner peace is certainly not just for the elderly.

It does not have to be reserved for those who are actually allowed to live more in retrospect than in prospect.

But it is precisely the prospect that stimulates thought about this.

Wilhelm Schmid (Serenity—What we gain as we grow older, 2014) has given special attention to the concept of serenity in his bestseller. How can these considerations be transferred to life as an engineer? Is there even a need for a philosophy? And doesn't growing older still have time? After all, I am only "in the middle of life" and full steam ahead is the order of the day, around me and also within me …

I am not talking about provocative equanimity, contrived coolness or casualness. I also deliberately exclude aspects of individual career planning here.

First of all, it helps to place serenity in life. The professional world discusses various life phase models. The one according to Bernhard Lievegoed (Life Crises—Life Opportunities, The Development of Man between Childhood and Old Age, 1979) sees life in four phases (Fig. 2.1), with professional life taking place in the two middle phases. The first of the four phases, that of childhood and youth (up to approx. 21 years), is

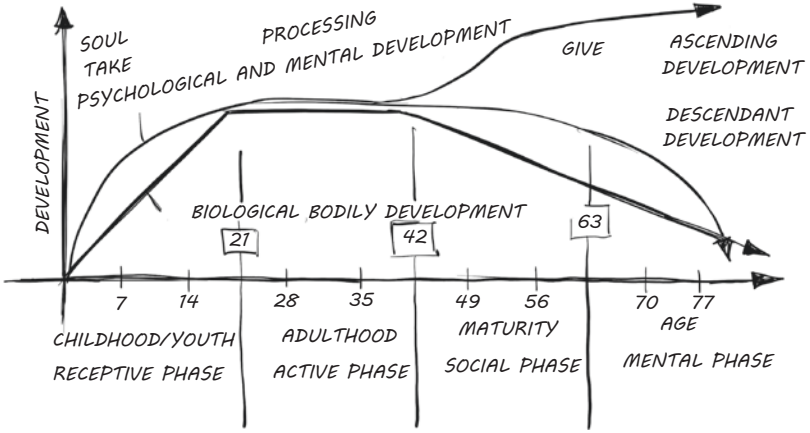

Fig. 2.1 Life phase model according to Sassen/Lievegoed

characterized by emotional taking and by psychological and intellectual, as well as biological development. After this receptive phase follows the active phase of adulthood (up to approx. 42 years), in which mainly the steep development of the previous phase is processed. The subsequent phase of maturity (up to approx. 63 years) is crucial for further, especially social development. Here it is decided whether the intellectual and social development continues to rise or, like the physical development, declines. In the fourth phase, the biological development is already strongly declining. But in this intellectual phase, the previous setting of the course in psychological and intellectual development becomes apparent.

However, this model can also be completely applied to professional life, which is then divided into the following four phases:

In the phase of "adulthood", the active phase of the model, the vocational training and the first years of professional life are initially located; the psychological and intellectual development reaches a first high plateau.

Approximately from the age of 42 (according to the model shown), the social phase of "maturity" begins—the change usually takes place over a longer period of time. In this phase, the personal, psychological and intellectual level can be developed to a further, higher plateau. However, those who do not actively strive for this development can already lose their intellectual level here, just like their biological strength.

The two phases can also be described as "processing" in the first phase of professional life and "giving" in the second phase.

According to this model, I am somewhere at the transition from the active phase to the social phase, where the process of becoming an adult can increasingly become maturing in the social phase. So there are parallels to my life and that of many colleagues of my generation—especially professional ones.

As an engineer, I am just one of many—even in my work environment, which consists of colleagues, customers and project partners, just one of thousands. These engineers all cook with water and primarily apply the laws of physics.

Like most, I am neither an entrepreneur nor a consultant nor a particularly specialized engineer.

My considerations on serenity arise from the observations of my professional environment. Also from the translation to my past, present and future.

If we focus the observations on the aspect of inner peace in the development of leaders (inexperienced and experienced) and of professional careers of various kinds, then there are two paths one can take. One path leads to balance. The other path, i.e. in the opposite direction, can also lead to loneliness.

Why serenity? Isn't that the most dangerous thing we as engineers have to guard against? A single mistake can have major consequences that make the person responsible live all the less serenely afterwards. I don't mean this kind of coolness—according to the motto: the testing engineer will already …, the boss is insured … or similar statements.

No, it's about serenity in dealing with each other, with other engineers, with customers, competitors, business partners and especially with colleagues.

As a middle-aged engineer, I am now also somewhere in the middle of my professional life; many years will still follow. But I am in a professional phase where a lot is in motion. I have a large part of my technical training behind me, have been responsible for management and leadership for several years. Of course, I look forward to what may still come. So I look at the older engineers, the experienced ones, who have experienced more or are responsible for larger things. But I also look back. This is essential, as I am also responsible for the training and further education of young colleagues with school or university degrees.

In both directions, I see progress. Looking forward, at the more experienced engineers, I discover examples of attractive paths, including the path of serenity. And looking at the younger engineers, I see them in situations from which they can develop and which I can remember well.

These are the two directions for the serene view: the one towards younger colleagues and the one towards the experienced senior engineer, where most aspire. There is also another perspective from which inner peace can arise: the small step back and the possible overarching attitude towards one's own profession as an engineer. This view from

a distance acts as a link or value standard for the two previously mentioned viewpoints. The three perspectives of serenity are therefore:

- Balance towards young engineers
- Prudent collaboration with senior engineers
- Reflection on one's own profession as an engineer

2.1 Equanimity towards Young Engineers

"Let them do, let them come." Young engineers must be allowed to do their work, after all, they should as quickly as possible know and be able to do what one already knows, but also still needs to learn in part. This serenity is the opposite of indifference.

We must trust the young ones as early as possible and challenge and thus promote them. Even young engineers should and can assert themselves under difficult conditions—just like we did back then and still do today in the fields where we are the young ones. We just have to let them and give them enough encouragement and attention. This can be returned to us in an unexpected measure.

The more we let go, the easier it becomes, because now more people are getting involved—and the more relaxed we can become ourselves. Young engineers will not be right about everything, but we should always give them the right to make their own experiences. They should also have the right to be professionally accompanied by someone who can heal wounds if necessary. Someone who does not just poke their finger in it, but provides guidance for self-healing.

We must assume that the young colleagues, the upcoming engineers, do not threaten us with new technologies and the latest state of knowledge. Instead, they can be the backbone of our inner peace. Because they will carry on the knowledge in the future, deepen it, improve it, think more modernly and can assist us aging engineers in staying in touch with the latest developments.

This applies on the one hand to the evolution of the entire engineering art, confirmed in retrospect on the history of technology. On the other hand, it applies to a high degree for each individual organizational

unit, for example for the engineering office, the bridge construction department in the administrative authority etc.

It is important that the older ones familiarize the young ones with the technical knowledge, with the how, so that they can develop. And it is equally important that the older ones let the younger ones broaden their horizons with new technology, its application, but also with detailed knowledge, for the research of which the experienced person often no longer finds the time next to his management tasks.

In addition, there is something very special: the relationship between very young engineers and very experienced senior engineers—between those who are just starting their professional lives and those who are often only a few years away from retiring from professional life.

This relationship can be highly efficient if it takes place in a benevolent atmosphere, if accusations are omitted, if prudence prevails. Experiences can be passed on as stories, big and small stories that bridge the gap from the newly learned of the young engineer to an overall picture of engineering. Here, awareness of the bigger picture can be planted and nurtured. And the senior engineer has the opportunity to grow, learn and discover the world from a new, more modern perspective.

Another relationship can lay the foundation for the engineer's serenity at a very early stage. Just as siblings grow up together and share experiences, young engineers can also form a strong network in which they share, help each other and benefit from each other. But there are hurdles to overcome: envy, competition and different career developments can initially put too much strain on the finely spun network. Here, the experienced engineer with serene leadership is needed to provide support, direction and goal, possibly with corrective hints.

The guiding, training and leading engineer plays a central role in the practiced equanimity.

For the young engineers, this guiding and training engineer is an essential part of a successful start into professional life. He has a significant influence on how the engineer approaches the subject with all the new things that there are to experience at the beginning of professional life, and how he identifies and establishes himself as an engineer.