Human Benefit

Thursday morning starts as usual, according to Henri's normal routines. Before continuing his assignment work, Henri calls his girlfriend, Irene, who is studying at the School of Art and Design, another part of Aalto University. Unfortunately, Irene now resides in Milano. She took a unique opportunity to spend a year in a famous design institute. It was a perfect choice for her, potentially offering a huge reward later during her career. Although Henri was happy on her behalf, he also was pretty worried about the future of their relationship. They called every day and met every second month, and, naturally, used social media to share their experiences almost all the time. Still, something was missing.

For some reason, the audio quality is today worse than normally and sometimes he has problems to understand what Irene is saying. He even develops a feeling that there is something wrong, although Irene is just telling a funny story about local students. In this situation, Henri wishes he had much better communication services so that he could distinguish nuances that reveal more than the words uttered by Irene. They have also used voice over IP service, but unfortunately, the network connection to Milano was unreliable. Henri was not sure whether the problem was with Irene's laptop. One of his friends has even suspected that a network operator deliberately deteriorates the quality of free IP calls. Perhaps.

On Thursday evening, Henri feels tired and disappointed with himself. The whole day passed by without any progress on any of his important undertakings. He also notices that he has barely remembered Irene even thought she is the most important person in his life. Similarly, he once again recalls the fact that his studies will not advance properly unless he becomes more resolute. He feels like he is wasting his time, or even his life.

Why on earth did Irene, in the first place, decide to go to Milano and leave me alone? When feeling blue, Henri always returns to this thought. Now his mind starts to fabricate numerous ideas to improve his mood. He grasps one of those: there are plenty of attractive female students starting their studies in Aalto University. He has met some stunning young ladies during some elementary business courses. Maybe some of them would be, Henri continues his thoughts and becomes a bit angry, would be more rational than Irene, who is sometimes painfully emotional. A basic lesson in the economics courses is that because people are naturally selfish their behavior should appear rational and predictable. In contrast, any rational reasoning just seems to irritate Irene, while a careless word may destroy a

whole day. Just now, he is very tired with all relationships. He is sad and frustrated; it would be much easier to live without considering the needs of others at all.

Sometimes frustration gives a seed that changes the direction of life. Henri decides to get into bed earlier than usually, sleep well, and start afresh on the next morning. As a last resort, he recalls the wise advice of Dr. Leopard on Wednesday afternoon. Henri assures himself that it is, indeed, possible to change the direction of life by means of conscious choice. There is hope, but it requires motivation and perseverance.

Human centric approach

The almost unbearable challenge of addressing human benefit in an introductory book is the vastness of the topic. Although I am an engineer by profession, I have read enough about the human mind to appreciate the enormous complexity of the issue at hand (or more accurately, the issue in mind), and enough to acknowledge the limitations of my own understanding.

There are numerous psychological phenomena that I consider crucial for a communications ecosystem expert (CEE) to understand, or at least, to be aware of. This chapter discusses some of those issues. In order to gain the necessary understanding a CEE needs, naturally, to read much more than what a limited book can ever provide. The goal of this discussion is, first, to encourage you to read more, and secondly, to provide some fundamental concepts related to the human mind needed in other chapters of this book. The main additional benefit of this chapter (compared to books that are more authoritative and articles) is a construction of formal models that combine psychological aspects with economic and user behavior models.

Why should we care about emotions in the context of communications services? The most obvious answer is that customer satisfaction, or lack of it, has major effects on the business of real companies. There are at least two other compelling reasons. First, the business potential of a new service, product, or application is regularly studied based on customer surveys. Surveys are composed of a set of questions that typically are related to the feelings and emotions that the item under study evokes in the respondents. Those questions must be relevant and well formulated. An even more important and challenging part of the study is the interpretation of the answers. What does it mean if a respondent says that she felt mild frustration, strong pleasure, or moderate happiness? It is easy to make statistical analysis and state that one product creates less frustration or more pleasure than another product. Emotions are, however, elusive matters to study and the results of the studies are difficult to convert to a form that can be used for modeling purposes.

Remember also Rule 1 explained in Chapter I: the driving force of the communications ecosystem is human benefit. This is the main reason for the whole discussion of the human mind. This chapter consists of several sections starting with some general observations about the functioning of mind and ending with the modeling of human decisions.

Terms

Before going to more specific issues, let us define the key terms used in this chapter:

> **benefit:** an effect of a product, system, event, or service which is judged positively with regard to some criterion or objective,
>
> **emotion:** a mental and physical reaction marked by a strong feeling that often prepares the body for action,
>
> **eudemony:** a measure of the more preferred state of affairs,
>
> **experience:** the content of direct observation or participation in an event,
>
> **human:** relating to, involving, or characteristic of human beings,
>
> **intuition:** the immediate knowing or learning of something without the conscious use of reasoning,
>
> **life:** animate existence regarded in terms of its continuance or prolongation,
>
> **metric:** a standard of measurement by which the most essential result of an action can be assessed,
>
> **mind:** the human consciousness that originates in the brain and is manifested in thought, perception, emotion, will, memory, and imagination,
>
> **quality:** the inherent nature of an entity perceived by a human mind,
>
> **sacrifice:** something that a person gives up to obtain something else considered more beneficial,
>
> **thinking:** the exercising or occupying of the mind, especially the understanding in an active way,
>
> **utility:** a quantitative attribute of a product to describe the usefulness of the product, and
>
> **value:** the worth, importance, or usefulness of something to somebody.

You likely are familiar with all other terms in the list apart from eudemony. These terms are, however, used more specifically in this context than they are used in everyday, informal text. Particularly, *benefit* refers systematically to all positive effects of products or services from the viewpoint of the user of the product or service. Correspondingly, *sacrifice* refers to a negative effect of a product or service for the customers. *Value* is used as a more general term not limited to something that can be perceived by a person. Note also that value is used in the term *value of time* instead of benefit of time because of established practice.

   As to *quality,* my intention is to use it primarily in a way that it refers to the *essential* nature of something *perceived* by human beings. Yet, because of the positive connotation, quality is exploited excessively, which makes it difficult to limit its usage to essential and perceivable properties. Thus, as a CEE you shall always be watchful when someone is using term *quality.*

In addition, the following 40 terms related to human aspects in communications ecosystem are defined in Glossary:

automaticity	feeling	love	QoE
brain	fixed mindset	mental	rationality
character	gross benefit	mindfulness	reasoning
cognition	growth mindset	mindset	SoC
cognitive load	happiness	mood	social capital
consciousness	holistic	net benefit	SoS
content	hope	opportunity cost	subconscious
context factor	human capital	outcome	value of time
expectation	intelligence	perception	well-being
externality	intention	prospect theory	zero-benefit level

Mind

Why do we need to consider the mind at all? Even though behaviorism is not anymore popular as a scientific doctrine, we might still be able to build an appropriate framework based on observed behavior without putting much effort to understanding what is going on inside the mind. A vast amount of research has been conducted, also in the broad context of communication, without defining the underlying assumptions about the principles of the human mind. In the worst cases, the underlying assumptions have been blatantly flawed, as in those economic studies in which human beings were assumed to be pure utility maximizers. Recent scientific studies have proved that human behavior, even in the context of economics, is much more complex than what some simplistic economic models have assumed.

Let us start with some terminological comments. Mind is so elusive an object that various conceptual constructions are possible. Figure H.1 illustrates the basic structure of mind adopted in this book. Although the structure is partly based on Kahneman (2003), *thinking* in the middle of the figure is based on the thinking of the present author. Thus, the extremely complex functioning of mind is condensed to four parts. First, perception provides interpretation of physical sensations produced by stimuli from external world. As to the other end, reasoning is a conscious, formal process to make convincing judgments based on known information. The middle section between perception and reasoning is divided into two parts: *intuition* refers to the complex unconscious processes that are able to purify the perceived information while *thinking* refers to all other conscious processes in our mind than systematic reasoning. Still it is obvious that thinking (as defined here) strongly relies on intuition and emotions and thus makes it a different type of process compared to formal reasoning.

Figure H.1 provides also a list of attributes in a way that the list on the left describes perception and intuition whereas the list on the right describes reasoning. Thinking is then a dynamic mixture of different properties. I recommend Kahneman (2011) as a source that provides an outstanding account on the convoluted properties of thinking.
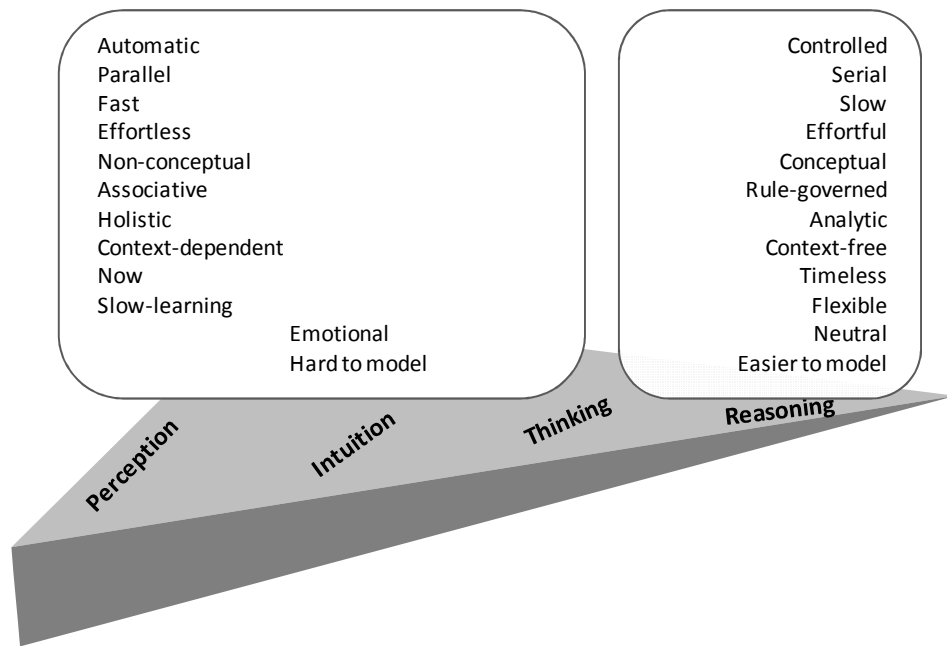
Figure H.1: A structure of mind, based on figure 1 in Kahneman (2003).

An essential phenomenon that every CEE has to be aware of is the integral role of automaticity in everyday life. The following brief introduction is mainly based on the prominent article by Bargh and Chartrand (1999). The article starts with the following citation:

> "It is profoundly erroneous truism, repeated by all copy-books and by eminent people making speeches, that we should cultivate the habit of thinking what we are doing. The precise opposite is the case. Civilization advances by extending the number of operations which we can perform without thinking about them – A. N. Whitehead, 1911"

Figure H.2 includes also an important, general lesson. Because most of the processes we unconsciously use everyday have been automatized without any conscious decision, there is no guarantee that automaticity serves our fundamental needs. When a habit is created automatically, the reason for it might be quite random. Most of us tend to first turn to the right (instead of left) when we arrive at a closed area or a building. This hardly is an intentional habit, because in many cases it would be more beneficial to turn to the left because the majority of others turn to the right. Consider, for instance, an amusement park on a crowded day. Randomness is, therefore, not necessarily harmful. On the contrary, what could be harmful is a situation in which an external agent intentionally makes you behave in a certain manner without your own conscious decision. Advertisements by tobacco industry are perhaps the most notorious example of this type of activity. Hardly anyone makes a conscious decision to ruin his or her health, still a large amount of people start smoking every day.

Finally, there is an even more subtle phenomenon that does not include any external culprit. The reason to select the same choice in a similar situation typically is that the choice seems in that specific context as the most efficient one for you. Even a cigarette is an efficient solution (for a regular smoker) to acquire immediate pleasure or stimulation. Whether an action is efficient is a different question than whether the activity in general is worth doing or not. In particular, unintentional automatization of actions that form an integral part of the relationship with your significant other could be dangerous. We also tend to use our reasoning skills as a rationalization machine, that is, to explain our automatized bad behavior in a favorable manner to both ourselves and other people. A flourishing relationship requires *intentional* training and automatization of smaller and bigger skills that serve the ultimate purpose of the relationship.
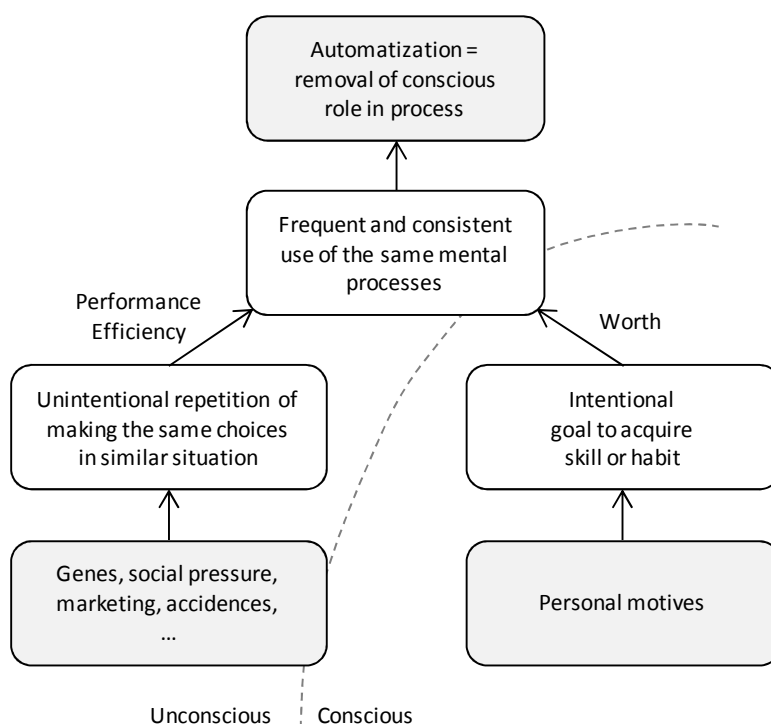

Figure H.2: Automatization of mental processes, based on figure 2 in Bargh and Chartrand (1999).

Then if you, as a CEE, consider communications services from this perspective of automatization, you may need to select between two approaches:

- to support the intentional choices of the users in way that makes it possible for them to improve their life, or

- to assist automatization that supports the business of the service provider without considering the consequences for users.

Obviously, the target of many advertisements is to create automatized processes, for instance, to select certain fast food restaurant without considering possible harmful effects on health. In some cases there is no significant conflict between these approaches, but in some cases there might be (even though the conflict is rarely as clear as in the case of the tobacco industry). Still, it would be good to be aware that without the intentional acquisition of a specific skill to consider the real benefit of users and customers, you will probably end up analyzing the business efficiency.

The automatization goes even deeper, so deep that it is hard to imagine and accept. According to ingenious studies, it seems that it takes about 0.5 second for any event to reach consciousness. In other words, you cannot use conscious thinking to steer any kind of fast operation! I guess everyone has experiences with this. For instance, if you want to learn a new dancing pattern, it is not enough to understand all the details of the pattern, first this step, then that one, at the same time move your hand in this way, and so on. First, the delay of 0.5 seconds makes dancing awfully slow. Secondly, it is almost impossible to consciously think of two separate things (like a pattern of steps and hand movements) at the same time. The only way to proceed is to automatize each part of the dance separately and then practice the dance as many times as needed. Even amazingly complex patterns that at first appear impossible to learn can be automatized.

What is also interesting is that if you learn a long pattern of movements, it is not only difficult to make any conscious change in middle of the pattern, but it is also difficult start the pattern in the middle. All kinds of activities can be automatized in a similar manner; think for example about your morning routines. The dream of any service provider naturally is that the usage of the service would become a part of everyday routines.

To this point, the phenomenon is quite apparent. But then there is another phenomenon that challenges our intuition. Let us consider a simple experiment in which you decide to move your finger on a random moment of time. According to scientific studies, when you decide to move your finger, corresponding neurons in the brain are activated 300 ms before you *become aware* of your decision. It really seems that even this decision must be unconscious. What might be possible for the conscious mind is the "power of veto": after an unconscious process starts the activation of neurons, it might still be possible to prevent the actual movement of the finger. I do not know whether preventing a decision is conscious or not. For a detailed discussion about these fascinating issues, see Libet (2004).

Emotions

This section offers a brief discussion about emotions, mainly to give a basis for the analysis of human benefits. We, as human beings, are highly reliant on our emotional capabilities. It is difficult to think of a life without emotions because if something does not evoke any emotion at all, even the slightest one, it does not exist for us. Thus, a sufficient level of understanding of emotions is necessary to conduct a systematic analysis of human benefit.

We can experience, distinguish, and name tens of emotions. All kinds of situations produce various emotions at the same time, and sometimes they appear to be in conflict with each other. Why do we need all of them? One way to see the role of emotions is to consider them mediators between two processes: the unconscious, highly parallel information handling processes (perception and intuition in Figure H.1), and conscious decision making and behavioral processes (thinking and reasoning in Figure H.1).

Figure H.3 shows 16 emotions located on a sphere. The figure was originally based on Geneva Emotion Wheel (Scherer 2005), but later several modifications were made to fulfill the special needs of this book. For instance, confidence (or feeling competent or powerful) and frustration are not usually deemed as primary emotions. However, when dealing with technology and users, feeling either competent or frustrated is a crucial distinction.
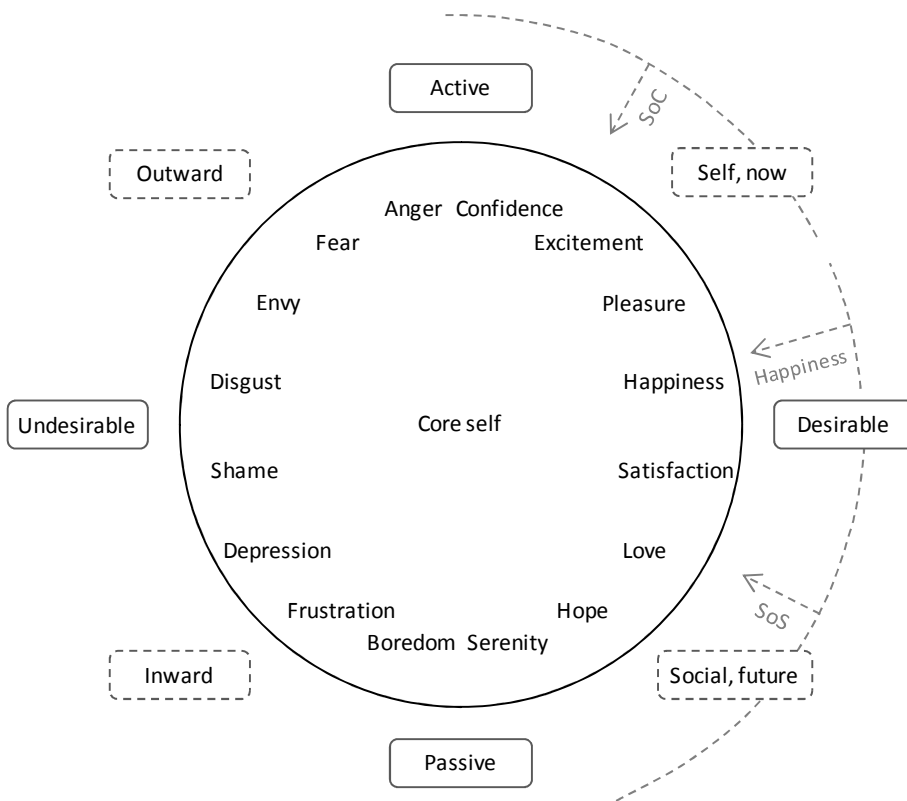

Figure H.3: Sphere of emotions with 16 emotional categories, partly based on Geneva emotion wheel (Scherer 2005), SoC = Sense of Coping, SoS = Sense of Significance.

Almost all emotions are easy to classify as either negative or positive. One may even speculate that this negative/positive classification is an automatic process that is a necessary part of the creation of more specific emotions. Still, as the further discussion indicates, positivity/negativity –assessment depends on both the context and the selected perspective. An event

that generates seemingly negative emotions may have positive consequences in the long run. Therefore, I use the distinction of desirable/undesirable that refers to the desirability of emotion from the perspective of the person experiencing the emotion. For instance, it seems obvious that pleasure is more desirable than depression and happiness is more desirable than shame.

Furthermore, many other distinctions can be used to categorize emotions. Some emotions are more action-oriented than other emotions. Anger persuades us to do something while serenity does not. Note, however, that both the desirable/undesirable and the active/passive – distinction shall be primarily thought as a binary code rather than as a continuous scale. For example, the position of fear and shame in Figure H.3 does not imply that shame is 75 percent more undesirable than fear (besides, it is very difficult to assess what does it mean to state that a particular instance of shame is as strong as a particular instance of fear). Instead the position of fear in the figure is related to the claim that fear is more outward-oriented while shame is more inward-oriented, that is, shame primarily concerns self and the state of own mind.

Then as to the desirable emotions, the upper quarter of emotions are related to a person's own experiences while the lower quarter of emotions are related to social interaction. In the framework of this book, serenity primarily refers to a state mind in which a person feels to be in harmony with herself and with her environment during normal life. In addition, the category refers more to spiritual concepts of mindfulness and enlightenment, which are the ultimate objectives of life according to some belief systems.

Love does not primarily refer here to the strong emotional, or even physiological, reaction during the initial phase of deep relationship (to fall in love with someone –type of event) but to a more general state of mind as follows:

> **love:** unselfish, loyal, and benevolent concern for the good of another.

Love can surely be the most rewarding experience; if love does not impress you, it is not true love. We may, nevertheless, ponder whether the strong emotion when falling in love is selfish or not. I leave that question open.

Many emotions are difficult to define exactly. As an example, Wiktionary defined *boredom* (in October 2011) as the state of being bored while *bored* was defined as the suffering from boredom. Consequently, boredom means the state of suffering from boredom. Boring, indeed, but at the same time somehow illuminating.

Furthermore, there is an important classification of emotions not illustrated in Figure H.3. Pleasure can be strong but still inconsequential while shame can be moderate but still have a long-term effect on your mood. Boredom can be deep for a while but hardly affects your core-self in any way unless the state lasts too long. Thus, an assessment of the strength of an emotion (for instance, on a scale from one to five) does not necessarily reveal how consequential the experience will be later on. Haybron (2008) uses terms central and peripheral affects to illustrate this difference. Concisely, a central emotion is something that really touches you whereas a peripheral emotion remains superficial even when it is momentarily strong. If a person is depressed, an event producing momentary, strong pleasure does not have any permanent effect on person's emotional state.

We can extend this rough structure of emotions by adding mood above central emotions and unconscious mind below peripheral emotions. Although there are many other ways to construct a hierarchy of mental processes, this model serves our purposes because it can be used in parallel with the hierarchy of activity theory (see Chapter U) illustrated in Figure H.4.

However, central emotions can also be used when selecting actions. On the contrary, missions and activities *should not* be selected based on peripheral emotions (at least if you want to achieve something profound in your life). In contrast, it might be unfeasible to consume precious mental resources to evoke central emotions on the level of actions and operations. Instead, it seems more reasonable to first start an *activity to develop* automatic processes that serve your most fundamental needs. For instance, you may decide to be respectful and compassionate in stressing and hostile situations.
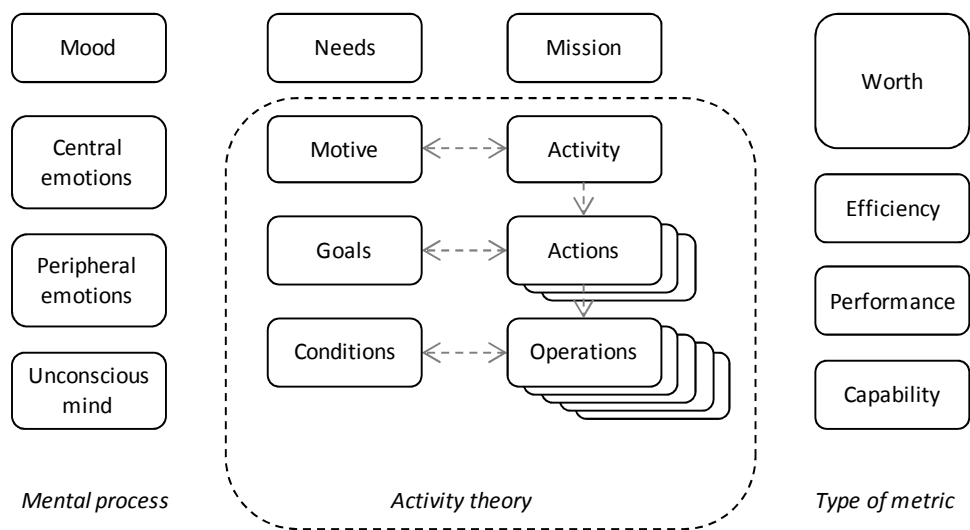

Figure H.4: Corresponding hierarchy of emotions, activity theory, and metrics.

The construction of activity theory provides also a link to the assessment of actions and to the hierarchy of worth, efficiency, performance, and capability (see Chapter T, particularly Table T.1 for further discussion about the terms). The decision to develop your ability to be respectful and compassionate shall be made because the results are worthy of spending your time and effort. Then certain actions can be selected based on the efficiency as regards to the goals of the action or based on pure performance objectives. Performance as a metric means essentially that only the immediate, easily observable, and typically positive outcomes are used to assess the merits of an action without thinking of the cost that the action may create in other domains of life.

Thus, we always need to be careful with performance metrics, because they sometimes tend to direct our life towards undesirable directions. Particularly, excessive optimization of economic performance might turn out be destructive. For instance, a carpenter that builds a

new house for his family every three years might consider himself clever because the house can later be sold for a significant margin. At the same time, he may ruin his family life. Is that sort of activity sensible? A scientist that wants to publish a new book every year encounters a similar dilemma.

We can also make a distinction between directly observable emotions and those emotions that require self-reflection and some level of conscious process to be observed. If you really fear something, there is no need to ask yourself whether you are scared. In contrast, to answer a question about your current satisfaction, you need an object (which might be your life, product, event, or something else) to be considered; only then you can observe the feelings that appear in your mind. You can think of your life or your mobile phone and then assess whether or not the emerging feelings reveal satisfaction or dissatisfaction.

In this framework, happiness is the most peculiar emotion. Either it can be considered as a direct emotion or as a construction (this is also illustrated in Figure H.3). You might just be happy when conversing with your friends or after a physical exercise due to increased level of endorphin in your brain. However, if asked how happy you are in general (when you are not particularly happy or unhappy during that moment), you likely start a process in which you ask yourself: am I happy or not? You may wait a couple of seconds during which period your intuition will give an answer, for instance: yes I am, considering how I have felt lately and what has happened to me during the last week. In general, that process of constructing an answer seems to combine memories of pleasure and excitement, on the one hand, and memories of satisfaction and love, on the other hand. How you finally emphasize different memories is influenced by your own expectations, social pressure, and the context in which the question is made.

You can be satisfied or dissatisfied, happy or unhappy, powerful or powerless, and hopeful or hopeless. In contrast, we do not speak about dislove or unshame. There are, of course, terms like shameless and loveless, but they are not really antonyms for shame and love. Thus, those emotions that are assessed by a scale that includes both negative and positive values are primarily constructions rather than directly experienced emotions.

Direct column in Table H.1 refers to the difference between emotions that are felt automatically without any conscious questioning. When you are frightened, your conscious mind does not need to make any question about your feelings. The experience is direct in the sense that you can often localize the feeling in a specific part of your body. You may feel nervousness in your stomach or shame on your shoulders. Moreover, your facial gestures may reveal your emotion (e.g., disgust or boredom) even when you do not recognize your own emotion.

In contrast, some emotions require, at least typically, a conscious inquiry. To estimate your happiness or satisfaction with your life, you have to use your unconscious mind. What is the form of the answer provided by intuition if you make a conscious question about your happiness level on a scale from 0 to 10? The form might be the pleasantness of your feelings in general, both in your mind and body, happiness when you are thinking about the momentary situation and near future, satisfaction when you are thinking you life in general over a longer period, and hope when you are thinking about your life in future. However, the form of the answer might be different for different people.

In the case of constructive emotions, duration in Table H.1 refers to the time scale we are thinking when assessing the emotion. In case of direct emotions, duration refers to the permanence of the emotion. For instance, fear typically disappears when the object of the fear is removed. In contrast, depression tends to be a permanent state of mind—and love should be.

As a side note it seems that in the modern western societies *love* is primarily thought as an emotion that must be authentically experienced without any intentional constructive process. Still it might be that for guaranteeing a long-term success it would be better to consider love, at least partly, a creation that has to be intentionally built and maintained in the minds of both partners. As a CEE, you may consider the question of how these two love mindsets influence the requirements of communications services.

Table H.1: Characteristics of selected 16 emotions.

Emotion	Similar emotions	Direct or construction	Deepness	Typical duration
Confidence	Self-respect, feeling of power	construction	-	medium *
Excitement	Elation, flow	direct	shallow	short
Pleasure	Amusement, fun	direct	shallow	short
Happiness	Delight, joy	construction *	-	short *
Satisfaction	Well-being, flourishing	construction	-	medium *
Love	Devotion, tenderness	direct *	deep	long
Hope	Trust, interest	construction	-	long *
Serenity	Mindfulness, gratefulness	direct *	deep	medium
Boredom	Apathy, fatigue	direct	shallow	short
Frustration	Dissatisfaction, irritation	direct	shallow *	short
Depression	Sadness, grief	direct	deep	long
Shame	Guild, remorse	direct	deep	medium
Disgust	Contempt, hatred	direct	shallow *	medium
Envy	Jealousy, greed	direct	shallow *	short
Fear	Anxiety, nervousness	direct	deep	short
Anger	Hostility, rage	direct	deep	medium

* Tentative opinion.

Some emotions classified as undesirable are beneficial in a specific situation. It surely is beneficial to feel fear when you walk on the rim of the Grand Canyon on a windy day. Or if you happen to put rotten food in your mouth, disgust is the right emotion to direct your actions. Anger can be thought of as an indication or utterance for others that they should be careful with their behavior and should take the interests of the anger person properly into account. Thus, negative emotions can be thought of as drivers for actions, even in a way that each negative emotion triggers its own type of action:

- Boredom: want to find something inspiring.
- Frustration: want to get rid of something.
- Depression: want to concentrate on the understanding and solving of problematic situations.
- Shame: want to become a better person.
- Disgust: want to avoid something.
- Envy: want to own something or to be similar to someone else.
- Fear: want to gain more power over environment.
- Anger: want to punish someone.

Depression differs from other emotions mentioned above because it typically lasts much longer and has a deeper effect on the life of the depressed person. Furthermore, it has been argued that people are not particularly proficient in assessing their level of depression. A person with a moderate level of depression might start to consider his or her situation normal after a while without any urgent need to improve his or her situation. Still there might be a lot of room to improve the state of mind. The energy consumption might also significantly decrease during depression, which obviously would have been a beneficial reaction before the era of modern society.

Thus each negative emotion can be thought as an instrument that is used to cope with a specific challenge life poses us rather than as a way to *measure* the general state of life. We need to keep this in mind when we use positive and negative emotions to assess our life. It might even be necessary for us to experience certain amount of negative emotions during normal life—the idea of an eternal paradise without any negative emotion ever is somewhat strange. Negative emotions can be seen as medicines that are healthful in small doses, but fatal in too large doses. Excessive usage of any specific (direct) emotion may cause addiction.

Nonetheless, we usually want to avoid situations that generate strong negative emotions. As far as a negative emotion efficiently serves its purpose of directing our behavior without disturbing the normal processes of life (either our own life or the life of others), we should not consider it undesirable or harmful per se.

It is harder to recognize the purpose of positive emotions than the purpose of negative emotions. Still we can say something about the needs that positive emotions may serve:

- Confidence: need to succeed in the struggle of life.
- Excitement: need to be fully immersed in something.
- Pleasure: need to get positive physical stimulus.
- Happiness: need to flourish.
- Satisfaction: need to live a good life.
- Love: need to experience deep relationship with another human being.
- Hope: need to believe in a positive future.
- Serenity: need to be in harmony with life.

In a way, the feelings of power, self-esteem, confidence, and competence are directly linkable to evolutionary success. We are putting quite a lot of effort to maintain control over other people and environment (or sometimes, just the appearance of control), even at the cost of displeasure and financial loss. From the perspective of an individual, the ability to control appears very positive. This may partly explain the attractiveness of control also in the domains of technology and management. The pure feeling of control or power can be rewarding.

Those positive emotions that direct our everyday actions, such as pleasure and excitement, are easy to understand: because pleasure is pleasurable, it is also desirable. Still, we need to consider the usefulness of pleasure deeper, because it is hard to conceive why evolution should generate pleasure, except in those cases where an action is important for the survival or reproduction of a person. Some examples are easy to identify and comprehend, but there also are many activities that create considerable pleasure without any evident evolutionary reason.

Many types of music, from hard rock to classical music can create excitement or deep pleasure. How could that kind of activity improve the survival or reproductive capabilities? This is a relevant question also for a CEE because listening to music is still a popular way of spending free time. The answer may lie in the development of internal processes in the mind to be used for other "more useful" purposes (e.g., for the synchronization of body movements during hunting). One purpose of music might be to deepen social bonds within a community; think about the role of music and dancing in African tribes. Musical capabilities may also serve as indicators of health and general abilities during the selection of partners. In general, it is considerably harder to comprehend the specific purpose of positive emotions. Barbara Fredrickson (2001) has provided a credible reasoning behind positive emotions in her *Broaden and Build Theory*.

Bad is stronger than good

This brief introduction to the topic called "bad is stronger than good" is based on the thorough article by Baumeister et al. (2001). In this context, good is desirable, beneficial, or pleasant, bad is undesirable, harmful, or unpleasant, and stronger produces larger, more consistent, or effects that are longer lasting.

This phenomenon has several fundamental effects on the human behavior. In the simplest case, we may consider the following chain of events. A person first finds a five-euro note, keeps it and becomes happier. Soon thereafter, the same person loses the same note and becomes less happy. The bad is stronger –rule states that the overall effect will be negative, that is, at the end the person is less happy than before finding the note. In case of concrete, measurable outcomes, the effect of a bad event seems to be 2 to 2.5 stronger than the effect of a similar good event.

A situation in which the phenomenon is likely stronger than what typical people believe occurs when a person wins a large amount of money. Certainly, the immediate effect of winning can be significant, and most probably, the immediate emotions can be predicted accurately. A much harder task is to consider the long-term effects. Figure H.5 shows the average opinion of 75 students when asked about the expected happiness after a lottery win of 1 million Euros. Happiness was assessed on a scale from 0 to 10. The immediate effect of

lottery win was assumed to be on average +3.3 (from 6.0 to 9.3). Most of the students expected that their happiness would permanently remain above the current level.

It would be difficult to conduct a true experiment with real money. However, various studies indicate that most of the positive effects of a lottery win tend to vanish within one year. A new apartment and a better car are able to create some pleasure, but hardly any permanent happiness. A sudden increase in the amount of available money may actually lead to excessive consumption of material goods. Eventually, the winner notices that he could not anymore sustain that level of consumption. The bad is stronger than good –rule states that the negative effect of the necessary reduction of consumption is larger than the positive effect of increasing consumption by a similar amount.

Moreover, a lottery win may disturb your relationships. Although your friends and relatives might be genuinely happy after your lottery win, it is harder to predict what kinds of long-term effects will emerge afterwards. Moreover, the bad is stronger than good –rule implies that negative effects will last longer than positive effects. As a result, a lottery winner may experience significant challenges after the early phase of increased happiness.
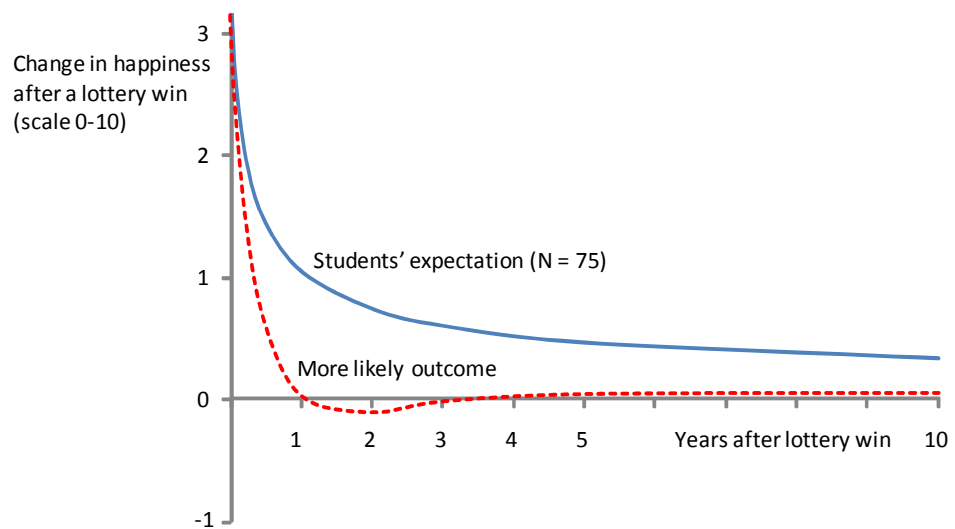

Figure H.5: Expectation about happiness after a lottery win.

It seems that if the nature of the outcome is harder to assess, the negative bias is even more pronounced. Figure H.6 illustrates a typical situation in which the effect of the bad is stronger phenomenon is prominent: two people communicate with each other about a sensitive matter creating emotions. The sequence of events is the following:

1. At the start, Person A has a couple of remarks in her mind, one of them positive from the viewpoint of the recipient (Person B) while the other one is somehow

negative. Person A believes that those two remarks were equally strong. Person A expects, thus, a neutral reply by Person B.

2. Person A utters the message consisting of two remarks by means of language, tones of voice, and gestures.

3. Person B observes the utterances given by Person A and makes his own interpretations (and most of them are profoundly unconscious). In spite of the neutral intentions of Person A, the negative remark produces an essentially stronger emotional reaction than the positive remark. Thus, the conclusion of Person B is that there was three times more negativity than positivity in the message.

4. Person B decides to balance the situation by means of two negative remarks. In his mind, those two remarks just mean that he reacts in a similar manner (particularly, in the spirit of tit-for-tat strategy discussed in Chapter E).

5. Person B utters his remarks by means of words, tones, and gestures.

6. As a result of the bad is stronger –bias, Person A hears two essentially stronger messages than what she made at the beginning of the conversation. Instead of a neutral message she receives (in his opinion) in total six times stronger negative message than what she uttered as a part of her original message.

The continuation of the conversation is obvious. Note also that both A and B believe strongly that she or he or behaved appropriately while the other person was the sole culprit in the conflict. However, in this example there is no difference in the behavior of the two individuals: both assume they had been fair and both had similar bad is stronger than good –bias.

According to some studies, there has to be at least three (and preferably five) times more positivity than negativity to produce a spiral of positivity both in personal and professional relationships. Thus if you want to be at least a neutral partner or colleague you must intentionally teach the automatic part of your mind to produce more positivity than negativity. In addition, you may somewhat alleviate the problem by being aware of the bias when interpreting the messages uttered by other people.

Our tendency to produce negativity biases in various situations is so strong that it is hardly possible to remove them totally. Why? Obviously, the bias has served some purpose during human evolution. To simplify a complex matter, we may speculate that the bias improves the likelihood to survive and pass genes because ignoring a possibility to get pleasure might cause regret, whereas ignoring a danger can be dangerous. In an unknown environment with strange people reacting to a bad incident more strongly than to a good incident might indeed be reasonable. However, it is harder to understand why we tend to have so strong a bias in close relationships as well.
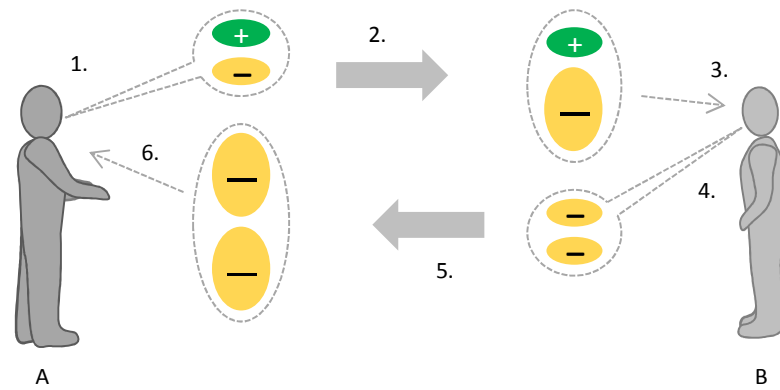
Figure H.6: A negative spiral in communication emerging due to the *bad is stronger than good* –phenomenon.

Other examples of the "bad is stronger than good" described in Baumeister et al. (2001) are:

- Consecutive bad outcomes create snowballing effect whereas good outcomes do not.
- Good events influence only good moods, whereas bad events influence both good and bad moods.
- When asked about important emotional events participants report four times more negative events than positive ones.
- Punishment leads to faster learning than reward. However, that does not mean that punishing would be appropriate teaching method when taking into account long-term effects.

We also tend to consider ourselves above average in almost any respect. For instance, when 82 students were asked how positive they are compared to other students the answers distributed on a seven-step scale starting form "much below" and ending to "much above" are as follows: 0, 4, 6, 22, 32, 19, and 8. Similar results can be obtained in various contexts. The result could also be explained by negativity bias: one self-assessment below average requires at least three self-assessments above average in order to balance the general feeling.

The main lesson for a CEE is that people (including CEEs, of course) are typically unable to take in account the full effect of the bad is strong than good –rule. We tend to concentrate on the immediate positive aspects. Even when we notice the possibility of negative effects, we underestimate their influence on our mood and on the mood of other people, particularly on longer time scale. Consequently, customers tend to buy new products based on the expected positive feelings they seem to generate, whereas the same products can be assessed afterwards based on the negative emotions they have generated. Finally, a CEE, as any other person, shall remember and appreciate the bad is stronger than good –principle when communicating with

anyone, both in professional and personal life. The principle is valid with you as well as with anyone else independent of your insight in the matter.

Happiness

The question about nature of happiness or life satisfaction can be considered both on the level of societies (or countries) and on the level of individuals. Figure H.7 presents the percentage of average quality of life on a scale from 0 to 10 as a function of per capita gross domestic product (GDP). Quality of life data is taken from Helliwell et al. (2012, figure 2.3) and gross domestic product data is from International Monetary Fund (2012). On this (inter)national level, there seems to be relatively strong correlation: in the sample presented in Figure H.7 the correlation between logarithm of GDP per capita and quality of life is +0.83.

However, this type of data does not enable any statement about causality. There are three basic explanations for the correlation. First, additional wealth (or GDP) genuinely increases happiness. Secondly, additional happiness has a positive effect on wealth. Thirdly, an external factor affects both wealth and happiness at the same time. In reality, society is an ecosystem where human aspects, like life satisfaction, and economy are complexly interacting.
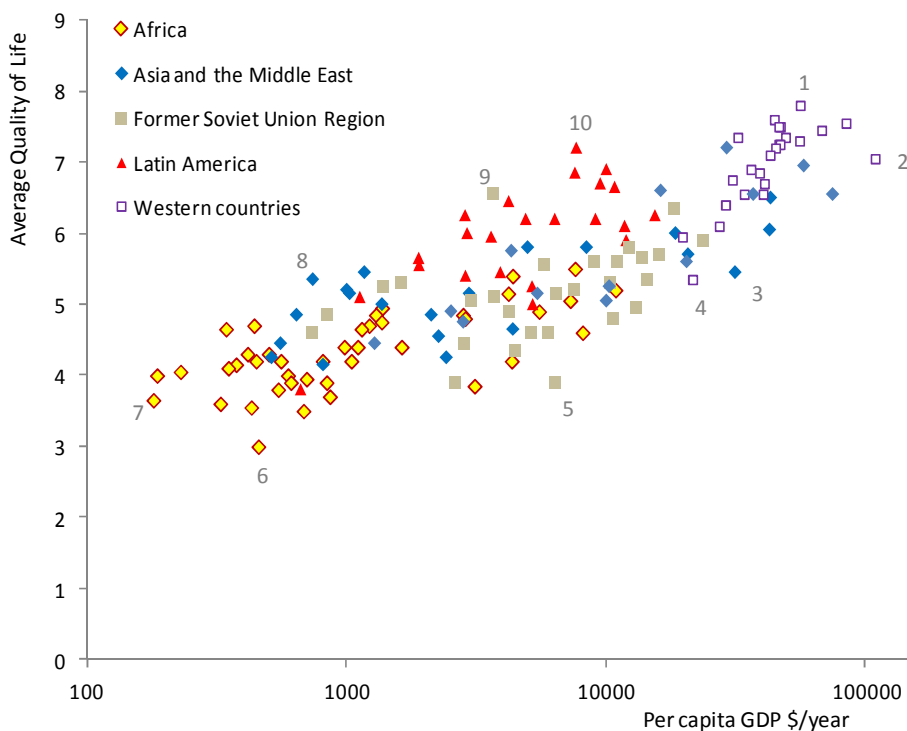

Figure H.7: Relationship between GDP and average quality of life.

The numbered countries in Figure H.7 are the following:

1. Denmark: the highest quality of life (7.8).
2. Luxembourg: the highest GDP per capita, but only with average quality of life among the group of western countries.
3. Hong Kong: for some reason the inhabitants are not especially happy in spite of high GPD per capita.
4. Portugal: the lowest quality of life in Western countries. Note also that the difference in quality of life between Portugal and Denmark is much larger than what could be expected based on the difference in their GDP per capita.
5. Bulgaria: the lowest quality of life compared to the expected quality of life based on GDP per capita.
6. Togo: the lowest quality of life (3.0). This low value cannot be solely explained by low GDP per capita.
7. Democratic Republic of the Congo: the lowest GDP per capita, still quality of life is as expected when poor wealth is taken into account.
8. Burma: quality of life is high compared to GDP per capita, particularly taking into account the general circumstances in the country.
9. Turkmenistan: (measured) quality of life is very high compared to GDP per capita, especially when compared to other similar countries in the same region. The value appears implausible when taking into account the nature of the country.
10. Costa Rica: the best example of the high quality of life in Latin American.

Figure H.7 also demonstrates some regional differences. Countries are divided into five regions:

1. Asia including the Middle East, but excluding countries that were part of former Soviet Union.
2. Africa.
3. The whole region controlled by former Soviet Union including Eastern Europe.
4. Latin America.
5. Westerns countries including Western Europe, United States, Canada, Australian, and New Zealand.

The relationship between happiness is obviously strong and linear when per capita GDP is presented on a logarithmic scale. In addition, there seems to be some regional differences, particularly, people in Latin America appear happier than people in countries that were under the control of former Soviet Union. Now we can make a simple model in which the average quality of life (on scale from 0 to 10) depends on GDP (on dollars per year -scale) as follows:

$$Quality\ of\ life = 1.7 + log_{10} GDP + c_r,$$

where c_r is constant for each region as follows:

- for Asia and Middle East: $c_r = 0$,
- for Latin America and Western countries: $c_r = 0.60$, and
- for Africa and former Soviet Union region: $c_r = -0.35$.

In regions, except Western countries, the effect of GDP seems similar, that is, if GDP per capita is doubled, the average quality of life is increased by 0.30. In theory, an increase of average quality of life of 0.30 within a group of 100 people seems to be equal to a change in which the life of three persons is improved from total misery to perfect life. However, we cannot be sure that the quality of life scale used in Figure H.7 is linear in the way that the eudemony scale discussed in the next section of this chapter is.

There are many other concerns about the credibility of happiness studies. Is it possible to measure life satisfaction in distinct countries in a way that makes the results directly comparable? It is also possible that the act of questioning people about happiness affects how they think and answer in general. The origin of most happiness questions is western culture, which may influence the way people are considering the questions. Furthermore, the possibility to make a comparison between our own wealth and the wealth of the richest people on the earth makes it difficult to be satisfied with our own life conditions. In this sense, the global distribution of information and entertainment (like popular TV series) may have problematic consequences.

Still, certain benefits of wealth and material goods are obvious, like improved health and decreased infancy mortality. The global availability of technical devices and imaginative products is usually considered beneficial for all, but that is not an obvious conclusion. Whether or not technical artifacts and the products of western culture truly improve the happiness or life satisfaction of people living in primitive conditions is hard to assess. Figure H.7 or any similar data cannot give any unambiguous proof about this issue. Still, the figure indicates that increased wealth could improve their happiness, when the respondents already are aware of the advantages of increased wealth (and less aware of the disadvantages of increased wealth).

Perhaps the most interesting finding provided by happiness data is the significant differences between areas, particularly between Latin American and Eastern Europe. While the material wealth is approximately the same, people in Latin American are much happier than people in Eastern Europe are. This indicates that the general atmosphere in a country may have a considerable effect on the happiness of citizens of the country.

Then on the individual level, a popular formulation for happiness (*H*) is the following:

$$H = B + C + V \qquad (H.1)$$

where

$B =$ biological, inherited set point that seems to explain 50 percent of happiness differences (typically S is used in this formula instead of B; here B is used because S refers in this book primarily to social and system aspects).

$C =$ conditions of your life, income, marital status, health, age, education, gender, etc., with relatively small (10 – 15 percent) effect on happiness.

$V =$ factors under one's voluntary control, personal development, represent about 35 percent of happiness variations.

The question from a modeler's viewpoint is: what does the formula concretely mean? Let us construct a simple model in which these factors together generate the total happiness of a person. Although Formula H.1 is illustrative and useful as a simple idea, we need to be careful when applying it in reality, particularly because the scientific evidence is limited and mainly based on a small number of studies conducted by Lykken and Tellegen (1996).

It is relatively simple to imagine a variation in inherited properties that have observable influence on the declared happiness of people. Let us assume that those hereditary variations in a society can be described by a standard normal distribution with mean of 0 and standard of deviation of 1. Moreover, let us assume that variations in the declared happiness can also be described by a similar normalized distribution with mean = 0 and standard deviation = 1. Now we might assume that Formula H.1 means that the happiness of individual (i) can be modeled on a normalized scale as follows:

$$H_i = c_b \cdot B_i + X_i \qquad (H.2)$$

where B_i is the inherited, biological set point of the individual, c_b is constant, and X_i describes the effect of all other reasons influencing the declared happiness of the individual.

Unfortunately, it is impossible to measure B_i directly because the relationship between genes and happiness is complex, and surely depends on the environment in which the individual is living. The most reasonable way to study this issue scientifically is to use identical twins, because they have identical inheritance. Nevertheless, it is not easy to estimate coefficient c_B because the twins may have more or less common in other factors that determine the happiness (X_i) of the individual. Identical twins have strong positive correlation in their health, wealth, mental capabilities, attitudes, preferences, and so on, even when they are living without any contacts with each other.

In principle, if might be possible to make controlled studies about the effect of some factors that may affect the happiness, for instance, wealth. It might still be difficult to design a study that is both economically and ethically feasible, and provides statistically significant results. Regardless of the difficulties it seems that wealth has on average a positive, though small, effect on happiness. However, according to Easterlin (2001):

> "At the start of the life cycle those with higher income are happier, because material aspirations are fairly similar throughout the population, and those with more income are better able to fulfill their aspirations. Income growth does not, however, cause well-being to rise, either for higher or lower income persons, because it generates equivalent growth in material aspirations, and the negative effect of the latter on subjective well-being undercuts the positive effects of the former."

Thus trying hard to attain wealth does not usually increase happiness. Similarly, health and some other aspects that can be called external conditions are able to influence the perceived happiness. Those conditions are often hard to change intentionally. The most feasible approaches in this sense seem to be to study the effect of participating in activities aiming at improving happiness like meditation, or to study the effects of antidepressants.

Some studies indicate that it is possible to improve life satisfaction by systematic training without directly affecting the external conditions of life (see Fredrickson 2009, p. 84 - 90).

Then if we return to Formula H.2, we may generalize it as follows:

$$H_i = c_b \cdot B_i + c_c \cdot C_i + c_v \cdot V_i + X_i. \qquad (H.3)$$

Perhaps we may even assume that the values for the coefficients are: $c_b = 0.5$, $c_c = 0.15$, and $c_v = 0.35$. Then we must also assume that there is something that can be called as "external conditions in total affecting happiness." That construction hardly has any exact counterpart in reality, because all kinds of matters form a complex system with deep interactions. For instance, there is a significant correlation between wealth and health, which makes it challenging to construct realistic model to describe their combined effect on happiness.

The last term representing voluntary control is even more artificial. Should we really assume that each person has a fixed ability and willingness to practice voluntary control? Still, if we want to remain in the area of mathematical models we have to assume something like that. Now we can make a simulation in which individual factors (B_i C_i and V_i) are normally distributed and independent of each other (here we ignore factor X_i). As a result, we get normally distributed variations in happiness as shown in Figure H.8.

Then we can calculate the correlation between happiness (H_i) and the factors B_i, C_i, and V_i. The results are +0.80 for B_i, +0.24 for C_i, and +0.56 for V_i. Thus the correlations are proportional to the coefficients c_b, c_c, and c_v, but larger than them. According to established convention, it is said that if the correlation is r, it explains a share of r² of the total variations. Thus in the constructed model biological inheritance explains 64 percent of the total happiness variations, conditions of life explain 6 percent of the variations, and voluntary control explains 31 percent of the variations.

If we want these three factors to "correctly" explain the variations in happiness, that is, 50 percent, 15 percent, and 35 percent, we have to select the coefficients differently: values of 0.71, 0.39, and 0.59 for c_b, c_c, and c_v, respectively, work properly.
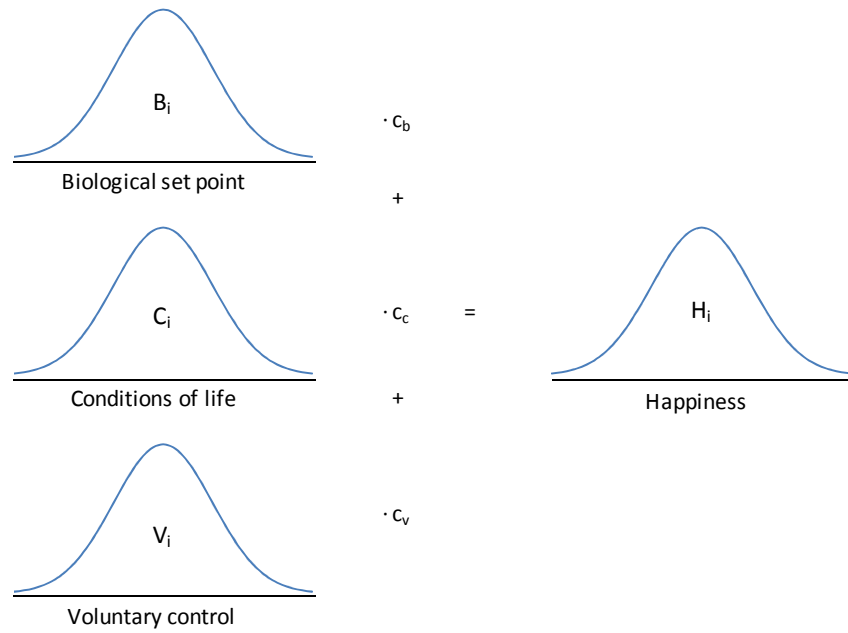
Figure H.8: Happiness as a weighted sum of three individual factors: biological set point, conditions of life, and the amount of voluntary actions.

Nonetheless, there remain many questions and problems. First, what will happen, if the person is living in a dissimilar society than the society in which the original study was made with different variations in all dimensions? For instance, in a society with larger economical disparities the income variations may explain more happiness variations. In contrast, in a totally equal society, income differences could not explain any variations at all. Similarly, in some societies biological variations might be smaller due to more homogenous population. This general problem is related to the normalization of the variation distributions. Because many factors are almost impossible to measure reliably, it is hard to judge how societies differ in the amount of voluntary control. We cannot assume that either the coefficients or the correlations will remain constant.

There also is an important dimension that is totally missed in the above model: the intrinsic nature of the community in which a person is living. The data shown in Figure H.7 implies that a considerable part of differences between societies is hard to explain by any properties of individual persons or by external conditions. Particularly, it seems that people in Latin American are happier than what could be predicted based on their living conditions. The most obvious explanation is the effect of communities and human relationships on individual happiness.

Are you confused with all these factors, coefficients, and correlations? At least, I am. So, what was the purpose of the above discussion about the difficulties of understanding the real formation of happiness and life satisfaction? It seems that the discussion have not led us to any

strong conclusions. A fundamental problem is that even though the results of scientific studies may have rather unequivocal interpretations in the realm of mathematics, it is difficult to transfer the results and interpretations to the realm of common understanding (see Figure A.1). Thus, aspects that are more important are:

- Which factors have the most significant effect on happiness or life satisfaction?
- What kind of methods can be used to improve life satisfaction in reality?

As to the first issue, my conclusion is that the model described above might be used for some illustrative purposes but it cannot be used for making realistic predictions about happiness variations. I would prefer to present the long-term happiness (or life satisfaction) of an individual as a complicated function of many factors including those mentioned above (biological inheritance, voluntary actions of the person, the atmosphere of the society, conditions of life, and random factors) as follows:

$$H_i = f(B_i, V_i, S_i, C_i, X_i) \qquad\qquad (H.4)$$

where S refers to the social aspects of life and other parameters are the same as in Formula H.3.

My feeling is that the factors in Formula H.4 are in a rough importance order. In a close community, the effect of society might be larger than the effect of voluntary, individual actions. In individualistic societies with large inequalities, conditions of life may have a larger effect on happiness than in societies with tight social groups. Finally, although random accidents may sometimes seem to have momentous effect on the happiness of a person, in most cases bad and good events balance each other in the long term.

The other question about methods to improve happiness is not discussed more profoundly in this book. Instead, I would like to recommend some extraordinary books including Fredrickson (2009), Lyubomirsky (2008), and Baucells and Sarin (2012).

Principles of eudemony

Communications ecosystem can be viewed from various perspectives as illustrated in Figure I.1. The four main perspectives used in this book are *human, technology, science*, and *business*. The four main metrics are *eudemony, performance, truth*, and *profit*, correspondingly. This section presents an approach to define the relationship between eudemony and profit. The main idea of this construction is that eudemony is the ultimate measure for assessing human benefit, that is, what is desirable for the society in which we are living. Profit is the primary measure for assessing the value of business activities. The overall chain of logic is presented in Figure H.9.
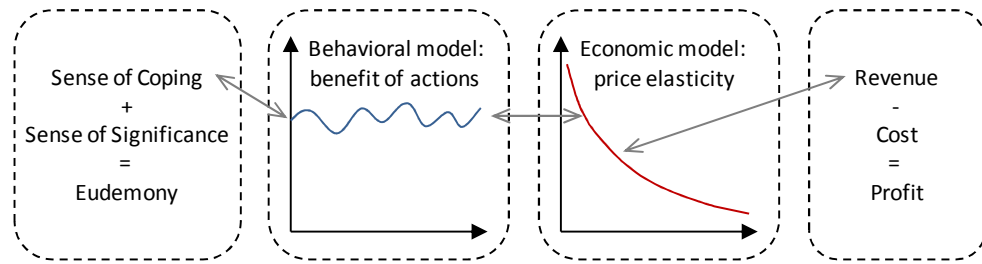
Figure H.9: Benefit model as a link between eudemony and profit.

What does good economy mean? This question returns to the even more fundamental question about good life, profoundly discussed already in ancient Greece (see, e.g., Nicomachean Ethics by Aristotle). What constitutes a good life is still a vital question. The way of thinking promoted by this book is well in line with the wise words of Aristotle: the purpose of an individual's life is not only to obtain momentary happiness, but also to live in a way that provides deeper meaning and takes into account the needs of other people.

The innermost concept of this book, eudemony, also has its origin in ancient Greece. Oxford English Dictionary defines eudemony briefly as "happiness, prosperity." Consequently, eudemony has been used occasionally as a synonym for happiness. Stafford Beer was the main promoter of eudemony as a concept to understand the fundamental objective of human society. Beer (1983) explained eudemony somewhat puzzlingly as "I-like-it-here kind of happiness, that does not prejudge the nature of the well-being that the people's will seeks to express."

The objective of this discussion is to formulate a strict definition of eudemony in a way that enables systematic numerical modeling. To achieve this goal, we define the following seven principles for eudemony:

1. No one except the person herself is able to judge his or her eudemony.
2. The value of eudemony at a certain instant of time can be expressed by a number.
3. A larger value of eudemony always means a more preferred state of life.
4. The same amount of change in eudemony, say, from 10 to 20 or from 80 to 90, is equally valuable for a person.
5. The same change of eudemony of a person (e.g., +10), has always the same effect on the society's aggregate eudemony.
6. When a person considers his life totally meaningless, his eudemony is 0.
7. When a person considers that she has been able to realize the full potential of her life, her eudemony is 100.

The principles from one to five together mean that eudemony is used as the ultimate criterion for assessing the well-being of both an individual person and the society as a whole. Further-more, the last two principles enable meaningful measurements and numerical modeling. If a person assumes that his life would continue in a way that eudemony remains on the zero level endlessly, the person is assumed to be totally indifferent about the continuation of his life. This

seems to be an adequate definition for zero eudemony. But what could be a reasonable criterion for a perfect life? Stafford Beer (1983) adopted term "human potential" when discussing about the genuine objective of society. The seventh principle binds the eudemony scale to the realization of human potential in the spirit of Beer, Nicomachean ethics, and Martin Seligman's concept of flourishing.

The objective of eudemony is to provide an absolute (rather than an ordinal or relative) scale for the most important preferences in our life. I admit that this is a philosophically ambitious objective, maybe even an unreachable one. Still, I believe that the zero level provides a strong basis for a credible analysis. The description that on the zero level a person is totally indifferent with the continuation of his or her life has quite an absolute meaning. The other reference level is more problematic, because a person's opinion about what a perfect life means may vary considerably.

Figure H.10 provides a rough model in which we assume that

sense of coping (SoC): the degree of confidence of a person regarding his or her ability to cope with the challenges of everyday life, and

sense of significance (SoS): the degree of belief of a person that his or her life is meaningful

form together eudemony as follows:

$$\Psi = \varphi_c \, SoC + \varphi_s \, SoS \qquad\qquad (H.5)$$

where parameters φ_c and φ_s describe the relative importance of SoC and SoS, respectively. I am indebted to Esa Saarinen for naming these two terms.

Both of them shall be rated, similar to eudemony, on a scale from 0 to 100. However, we have to be aware of the abstract nature of this formula: we can hardly assume that there is something objectively measurable in our minds that could be called sense of coping or sense of significance. Nevertheless, we might be able to design questionnaires and then to construct a model that translates the obtained answers to SoC and SoS. Moreover, we could assess the eudemony of the same participants in similar manner. Finally we could make statistical analysis to deduce what are typical values for φ_c and φ_s. Because there is no statistical evidence so far for Formula H.3, the presented model should be thought primarily as a framework that gives some directions for our thinking and reasoning.
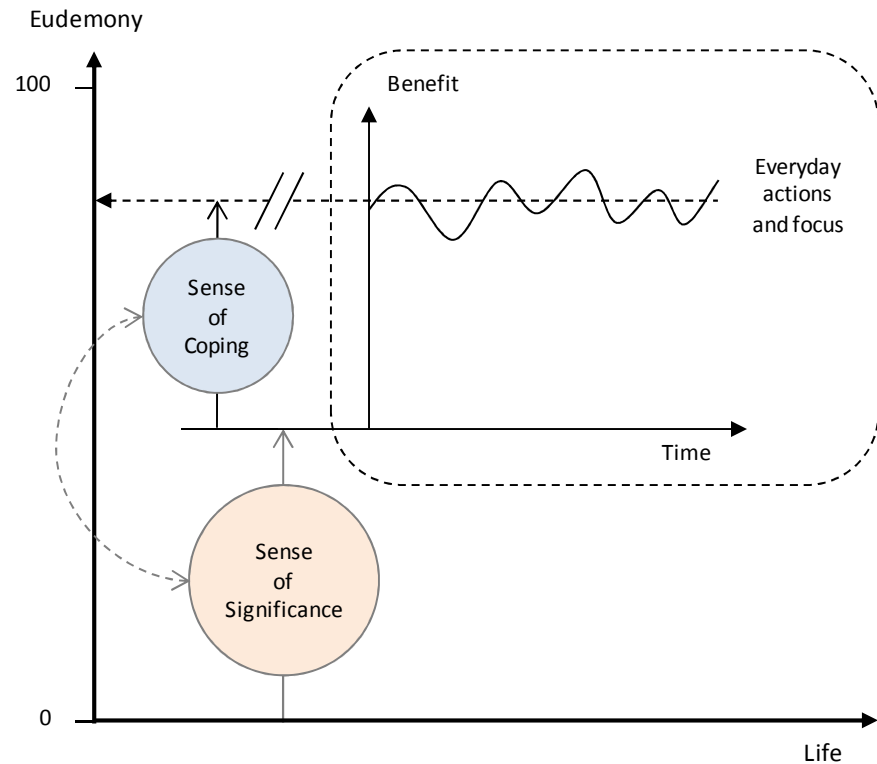
Figure H.10: Eudemony as a combination of sense of coping and sense of significance.

Finally, we can make the following observations:

- Sense of coping and sense of significance are not totally separate aspects of life. Instead, they may have complex mutual effects on each other (illustrated by the arrow between them in Figure H.10).
- Different people may give different weights (φ_c and φ_s) to SoC and SoS.
- SoC and SoS might also be considered almost orthogonal dimensions as sketched in Figure H.3.

There is not necessarily any straightforward relationship between various emotions and SoC and SoS. Actually, the relationship depends on how each person constructs SoC and SoS. There are at least three options. First, we may make direct questions, like, how well you are coping with the challenges in your life on a scale from 0 to 10? Secondly, we may make several emotion-related questions and combine the results using individual weights for each answer. Thirdly, we may attempt to somehow deduce the level of SoC and SoS by observing the life of a person. We might apply all these options and combine the results, too.

Some people may consider competence and power the main ingredients of SoC, which means that some negative emotions (especially anger) might serve as a positive indication of SoC. Moreover, some positive emotions (even love) can be problematic for these kinds of people because they might deem seemingly positive emotions harmful for their venture towards increased sense of coping, that is, increased control and power. For those people happiness as such might be almost irrelevant. In contrast, for some other people SoC may be more closely related to the ability to feel excitement and pleasure. From that perspective, other emotions, like anger and love, might have a minor effect on SoC, if the average amount of pleasure and excitement is kept constant.

We may in any case make the following three assumptions: first, factors φ_c and φ_s in Formula H.5 lie between 0 and 1 in a way that a larger φ_c means a smaller φ_s, secondly, SoC is directed towards the sector of competence, excitement, and pleasure, and finally, SoS is directed towards the sector of satisfaction, love, and hope.

A state of mind in which the sense of significance of a person is permanently diminished will most likely have an effect on the sense of coping as well. For instance, the person may try to increase his sense of coping by being greedier or angrier towards other people. In the short term the person may, indeed, feel that his ability to cope with everyday challenges is improved. The person might be right in his feelings, but still it is likely that his sense of significance will be reduced, because he will likely deteriorate the quality of his social relationships.

All together, these intricate phenomena make it difficult to conduct any reliable statistical analysis on the relationship between various emotions, SoC, SoS, and eudemony, because almost any result could be explained by individual differences. The key question from the modeling viewpoint is: do ordinary people *behave* as if they try to maximize eudemony, sense of coping, or sense of significance? My assumption is that during everyday life most of us are concentrating on something that can be called sense of coping. However, in retrospect, we still may appreciate more those actions that have affected the sense of significance.

Benefit models

The primary purpose of the benefit model is to describe our everyday behaviors in a consistent way in order to make predictions about the affect of different aspects including technical quality, usability of devices, and prices of services. As to the eudemony model presented in the previous section, the benefit model provides a link between economic activities and sense of coping as illustrated in Figure H.11.

Business analysis is typically based on the elasticity of demand model that tries to answer the question: how does a change in price affect the demand of the service? In the framework of this book, the most fundamental function describes the gross benefit obtainable by the user of a service while the price of the service is only one of the cost components. The graph on the right side of Figure H.11 describes the monthly usage of text message service of an average person belonging to a customer segment. All sessions spent with the service are put in benefit order. The left side of Figure H.11 describes the same events in the ordinary time scale. The person has all kinds of activities that create variable amounts of benefit. Each column in the

figure represents a single action (in this case, sending a text message) that is the most beneficial action available at that moment.

The fundamental assumption is that the person selects the action that provides the highest expected benefit. However, it shall be stressed that I do not claim that persons are making any conscious utility calculation when they make small everyday decisions (or even less that their decisions would always be correct in any respect). Rather most of the decisions are automated as described in the beginning of this chapter.

If we consider how the text message service affects the sense of coping, we need to assess the additional benefit obtained during a period, let say, a month. The total net benefit is the grey area between demand curve for the service and the average benefit obtained during everyday life in Figure H.11. If the person spends 20 minutes per day writing, sending, receiving and reading text messages, the net benefit might be about 100 dollars per month. Even though that is a considerable amount of money, it means only 0.21 dollars per hour when the money is divided over all hours the person is awake during the month (shown in the left side of Figure H.11). Finally, this increase has a positive, though small effect on the sense of coping.
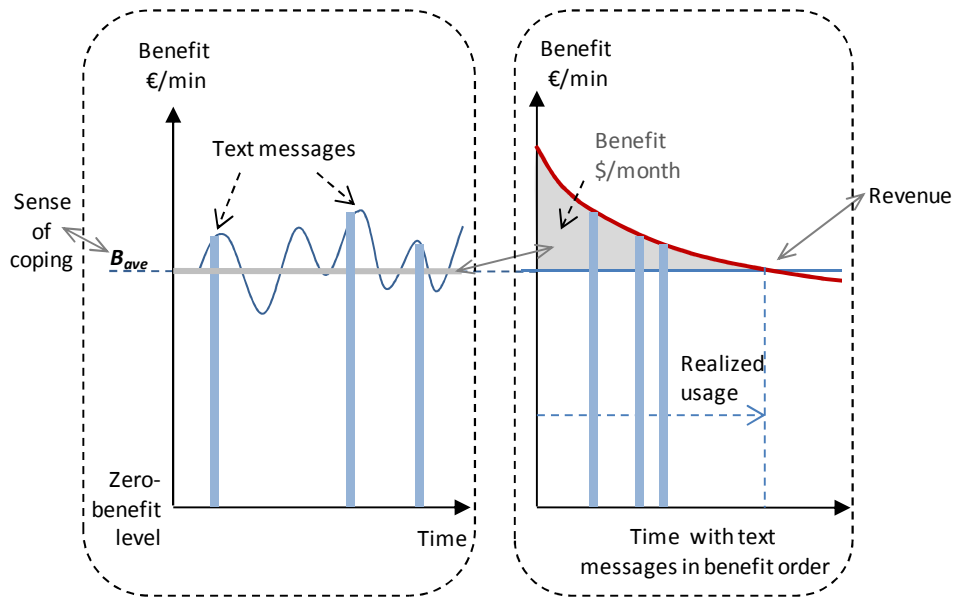

Figure H.11: Effect of text message service to the sense of coping of a person.

Value of time is one of the key concepts of the benefit model. What do we mean by value of time? This is an appropriate question and requires as clear answer as possible. It might be reasonable to start with a brief historical account. My professional background is in the area of quality of service in communications networks. I spent, among numerous scientists and researchers, almost ten years designing, analyzing and optimizing network mechanisms aimed

to support all kinds of performance requirements set by applications. Voice calls require low delay, video streaming applications require guaranteed bit rate with low packet loss ratio, and data applications require intermittently very high bit rates. The ensuing complex system to manage all these requirements was expensive to realize and hard to manage and operate. Many technically excellent features were ignored in the real business environment. Variable Bit Rate service for Asynchronous Transfer Mode (ATM), Integrated Services for the Internet, and the quality of service framework for General Packet Radio Service (GPRS) are examples of business failures.

Why did these brilliant technical systems never generate any noticeable business? Our research group at Nokia Research Center turned attention from applications and technology towards user experience. In particular, Olli-Pekka Pohjola and I tried to explain why services based on Wireless Application Protocol (WAP) flopped and why the demand for mobile data applications was so limited during the early years of mobile broadband (see Pohjola and Kilkki 2007). In order to examine these issues we had to combine economic, usability and technical aspects together. To achieve this, we had to combine money (price of service), usability (time and effort), and technical performance (delay, bit rate, packet loss ratio) in one integrated model.

After several intermediate steps, we ended up with the model described here. The key terms of the model are *gross benefit*, *sacrifice*, *net benefit*, and *value of time*. The interrelations between the concepts are depicted in Figure H.12.
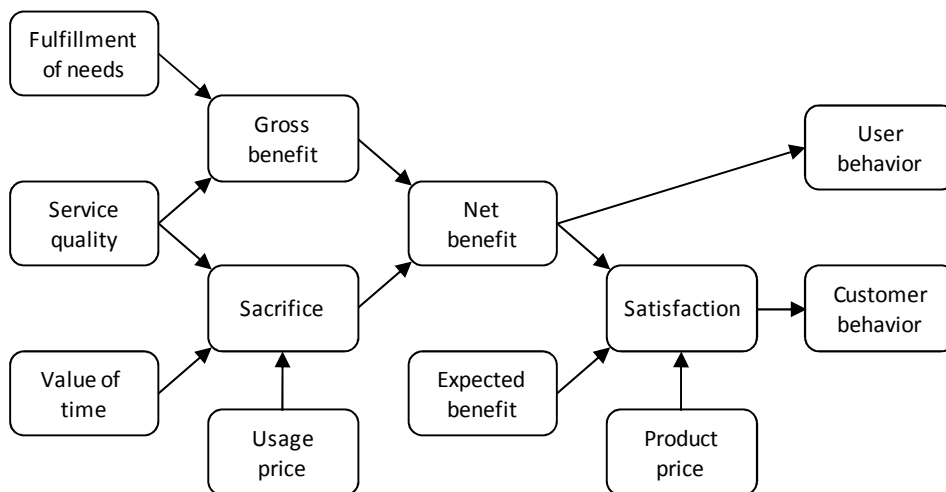

Figure H.12: Key concepts related to human benefit and behavior.

Now when I consider this framework, the structure seems clear and almost obvious (you may, of course, disagree). Nonetheless, there was no clarity when we started to develop the model. Although we considered some other promising options too, it became soon clear that we needed to introduce a monetary scale that could be used to combine diverse aspects. Why did

we select a monetary scale? First, since we had to consider economic aspects, we needed to convert other aspects to a monetary scale at some point of the analysis. Secondly, a monetary scale is naturally linear and transitive in the realm of business: the difference between 10 and 20 Euros is exactly the same as the difference between 10 000 and 10 010 Euros. In contrast, as shown by Kahneman and Tversky (1979), the psychological effects might be essentially different: the experienced difference between going from 10 to 20 Euros is typically much larger than the experienced difference from 10 000 to 10 010 Euros (see the section about prospect theory in Chapter E). Yet, in order to create a tractable mathematical model, a linear scale is almost unavoidable.

Still, I am somewhat reluctant to apply a monetary scale to depict the core characteristics of human behavior. We do not usually measure the importance of our everyday actions on a monetary metric. Thus, several years later I had to also define a linear, but non-monetary scale for assessing the fundamental preferences in life, that is, the eudemony-scale. Remember that we need seven rules to construct a linear scale for eudemony!

Actually, forcing a person to think of the consequences of an action from an economic viewpoint may change the person's behavior in a bizarre manner. A famous example is a situation in which a kindergarten in Australia designed a system of a monetary fine for those occasions where parents did not pick up their children on time. Unexpectedly, the fine increased the share of parents that did not pick up their children on time. The reason seemed to be that parents thought of the fine as a payment, which made it acceptable to pick up the children later. Unfortunately, when the fining system was removed, the system did not return to the original state. Thus, the monetary scale adopted here shall be considered a necessary instrument that facilitates modeling, not as a statement that we measure (or even less, should measure) everything in our life by means of money.

In any case, in the ecosystem model value of time, sacrifice, gross and net benefits, and product and usage prices are measured on a monetary scale. Thus, the unit for value of time must also be Euros or dollars per minute (or something similar).

How large, then, is the value of our time? A seemingly reasonable and simple answer appears to be that the value of time of a person is his or her net wage. Obviously, a person converts time to money by working. However, from modeling viewpoint this choice is problematic because we usually also obtain other benefits than money when working. Even if you were working in a hamburger bar, you still can interact with other people, perceive all kinds of incidents, and learn something. Thus, even if we assume that you are not paid anything, you likely do not think that you have totally wasted your time. Besides, many people are willing to do voluntary work without any salary. We cannot assume that those people feel that they are wasting their time.

In order to build a useful model, we shall define two dimensions and the place of origin. The first dimension, usually presented as the horizontal axis, can obviously be called *time*. The other dimension is harder to name. We had various choices during the development of the model, but finally we selected the term

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benefit: an effect of an event that is judged positively with
regard to some criterion or objective.
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To put is simply, the ultimate criterion for assessing whether something is beneficial is to assess whether it serves the purpose of life.

We do not need to define a zero point for the time scale, because we are mostly interested in the duration of events, not in any specific points of time. In contrast, it is useful to define an unambiguous zero-level for the benefit dimension. We call this level *zero-benefit* level. The aim of this term is quite the same as the sea level that can be used as a reference level to determine how high a mountain is. On the zero-benefit level, persons are not able to use their time for any desirable activity while their fundamental needs related to safety and physiology are still fulfilled. In brief, on the zero-benefit level people completely waste their time. Using this concept of zero-benefit level, we define the value of time as the average benefit per time unit above the zero-benefit level obtained by a person during everyday life.

These two references, zero-benefit and value of time, can be used to assess how beneficial each action is on a well-defined scale. If the action is a total waste of time, the benefit obtained during the action is zero. If the benefit is about what you get on average during your everyday life, the benefit is about the same as your value of time. A possible framework to define zero-benefit level is the hierarchy of needs proposed Abraham Maslow (1943) consisting of:

- the physiological needs,
- the safety needs,
- the love needs,
- the esteem needs, and
- the need for self-actualization.

Although Maslow did not claim that these needs form a strict hierarchy, typically an individual fulfills the lower needs (physiological and safety) before moving towards the higher needs. Thus, we may consider the zero-benefit level a state in which a person is able to fulfill fundamental physiological and safety needs but is not able to fulfill any needs on the higher levels. However, we need to be careful with this analogy, because the zero-benefit level shall not mean a state in which human and social capital are significantly reduced. For instance, if a long period without any communication with other people significantly weakens a person's social relationships, the total benefit over the period is negative instead of zero. In general, being on the zero-benefit level means that the total degree of fulfillment of various needs is zero.

Figure H.13 presents an example of a session that starts at t_0 and ends at t_4. A similar model is also presented by Baucells and Sarin (2012, p. 32 - 36) although they use somewhat differing terminology.
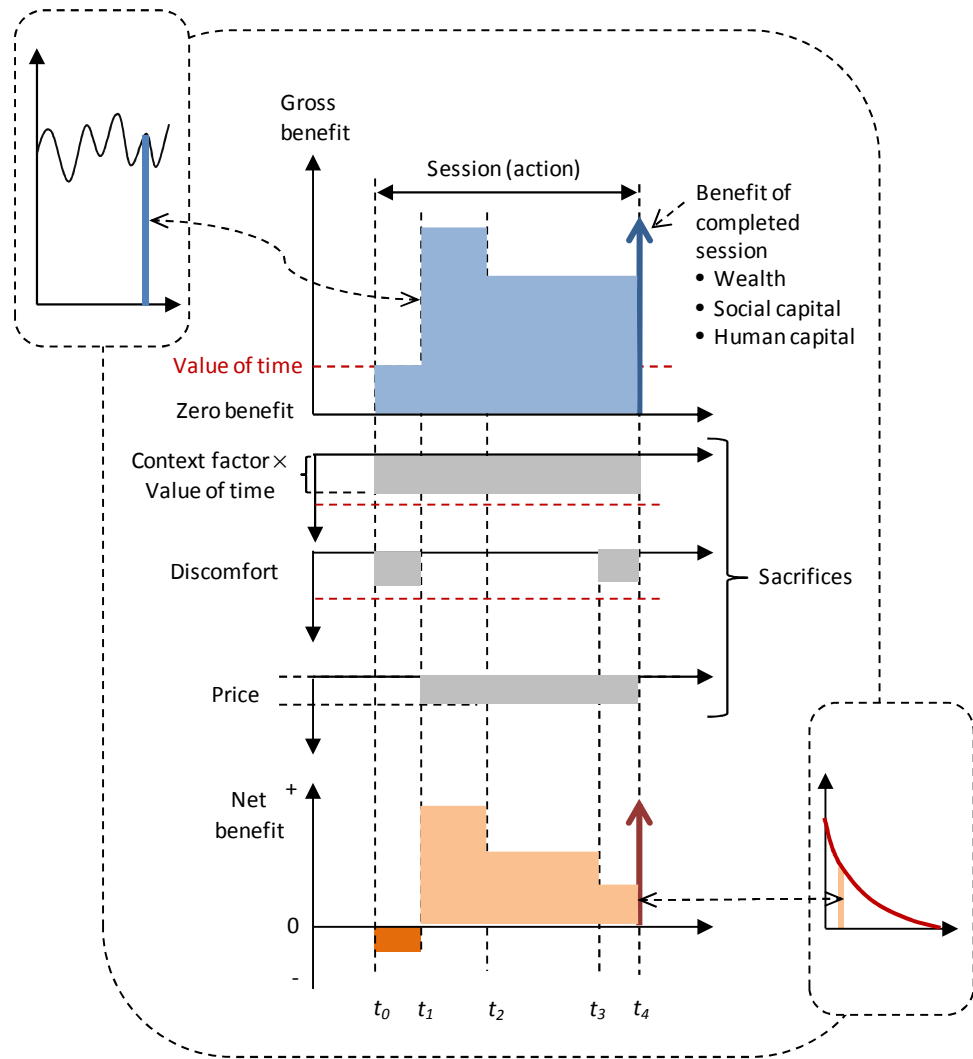
Figure H.13: Benefit assessment for a session.

The context factor in Figure H.13 is about 0.8, meaning that during the session the best alternative action would provide about 20 percent less benefit per time unit than what the person is able to obtain on average during an ordinary day. In Figure H.13, the session is started with a somewhat frustrating period until t_1. The frustration measured as the level of discomfort is about 70 percent of the value of time of the person. Although the net benefit is negative during the initiation period, the person is ready to accept a period of discomfort to achieve pleasurable experiences later. From t_1 to t_2, the experience is particularly pleasurable creating significant net benefits even though the person has to pay fairly high price for the service. The gross benefit of the service then remains constant until the end of the session.

However, some additional discomfort emerges at t_3 due to quality problems in the service. During the session, at each moment of time the net benefit is the gross benefit minus the sacrifices (= value of time × context factor + discomfort + price).

Note also that the commonly used term:

> **opportunity cost:** the cost of a commercial decision regarded as the value of the alternative that is forgone,

is similar to the concept of value of time. If we interpret *value* in the above definition as the gross benefit provided by alternative ways of spending time, value of time is close to the average opportunity cost of the best alternative action. However, then we need to take into account also the sacrifices that are avoided when the best alternative action is not selected.

To some extent, gross benefit is also similar to

> **quality of experience:** a subjective measure of a user's experiences with a service or product.

Thus, *quality of experience* refers to the quality aspect of a service (how well a given service is realized from the customer perspective) whereas gross benefit refers to benefits obtainable due to the content of the service (for instance, the importance of a phone call). In a simplified model, a certain type of service is expected to provide certain gross benefit while the quality of experience is a factor that multiplies the gross benefit. For instance, a decrease of experienced quality from *excellent* to *fair* (see discussion in Chapter U and Figure U.4) may decrease the gross benefit obtained during the session by 17 percent.

In addition to the positive experiences during the session, we need to take into account all benefits that the person obtains later because of the session. Most obviously, if the session is a paid activity, the money earned due to the session means increased wealth. There are also other types of capital that can be accumulated over time. The social capital of an individual person improves eudemony through other persons and social networks, while human capital improves eudemony through a person's own skills and knowledge. The term capital is used because the potential (for positive effect on eudemony) accumulates, at least to some extent, and can be gathered over a longer period. Social capital includes aspects like the social status and general reputation. An action may have a negative effect both on human and social capital.

In general, social capital is the collection of shared norms among a group of people that promotes social cooperation, instantiated in actual social relationships. As a recognized member of a group, a person can gain from the (total) social capital of the group. Individual social capital depends, thus, both on the total social capital of the group and on a person's ability to exploit the total capital. For an outsider, the ability is non-existent or even negative, if the group acts against the person as a group. In case of a small group, a person's action may directly affect (either increase or decrease) the total social capital of the group. In contrast, in a large society, this direct effect is usually insignificant. Thus, the person is likely more concerned with his ability to gain from the total social capital than with the size of total social capital of the group.

If a student spends a period in a class to learn something new, we may either think or feel that the learning process as such creates pleasure during the period, or that the gain is obtained afterwards through her human capital. It is somewhat hard to make a distinction between these two perspectives, because they are mixed in our minds: the prospect of later gains creates pleasure already now. However, we may think as a rule that all gains that are obtained only afterwards are included in either human capital, social capital, or wealth. Thus, if the lecturer is a pleasure to listen and watch, the pleasure is included in the gross benefit of the session. A similar observation is valid with a period when you are reading this book. You may feel pleasure, discomfort, confidence, or frustration. You may in any case continue reading if you believe that you are able to obtain high enough gain later.

Many portions of human capital have the peculiar property that the use of them may increase the capital. If you exploit your knowledge, say, about system theory, your knowledge will likely be increased. In contrast, if you spend your money, you have less money. As to social capital, both increase and decrease are possible outcomes. You may either exploit social capital in a manner that reduces your abilities to use social capital afterwards (for instance, by behaving dishonestly in order to obtain short-term benefit). In contrast, if you behave cooperatively, you may both gain from your current social capital and at the same time increase your ability to utilize your social capital later, because other people will trust you more than before.

Value of time experiment

Value of time is a useful or even mandatory parameter in models that describe how we make our everyday decisions. Time certainly is a limited resource that can be used more or less efficiently. The most urgent challenge is that there is not any straightforward method to assess the value of time of any individual person on a monetary scale. It is hardly feasible to ask a person: what is your value of time? As a minimum, the person asking the question has to define as exactly as possible how value of time should be understood. Without a specific definition, it might be that those people that have regular jobs assume that their value of time is the same as their net wage. For other people, like students, the question is more difficult because there is not any clear reference level similar to wage.

Now the framework described earlier provides an opportunity to assess the value of time of any people independent of their condition of life. The framework in which the assessment is made is described in Figure H.14. We assume that in the current situation the consumption of services and the income of the person are in balance with each other. Then we ask the person to consider carefully four different ways of spending time (rounded boxes in Figure H.14):

1.   Spending time on a typical day without any money involved.
2.   Consuming typical services, for instance, in a movie theater or in a cafeteria. The price of ordinary services (p in Figure H.14) is almost constant, for instance, in Finland roughly 5 Euros per hour when the main benefit of the service is experience itself, not anything that can utilized afterwards.

3. Doing ordinary work in well-defined conditions. The work shall be done primarily for earning money that can be consumed afterwards. In case of students, hamburger bar is a possible choice.
4. Spending time on the zero-benefit level. The situation shall be described as realistically as possible.
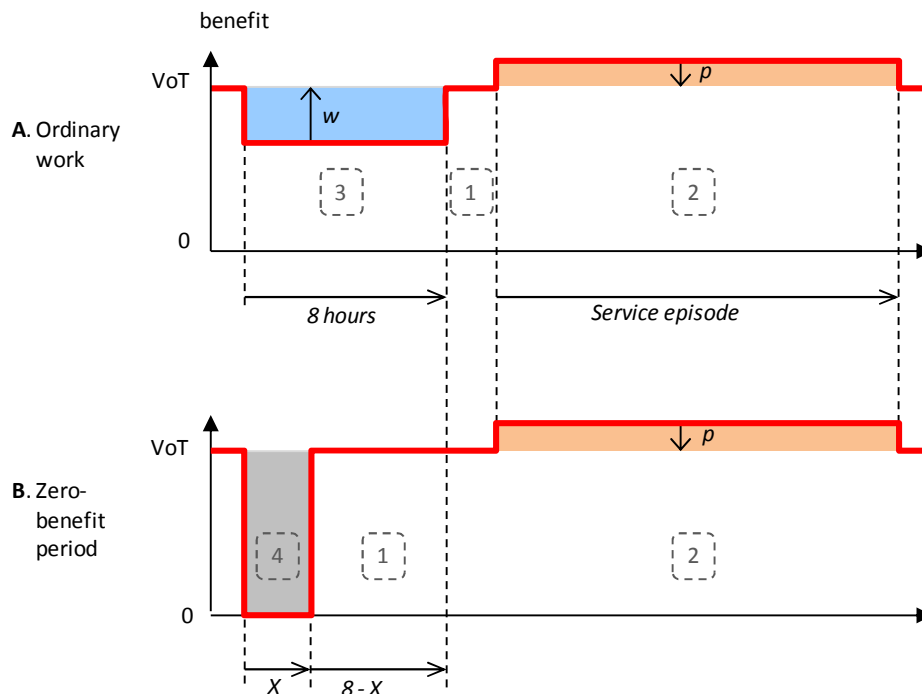

Figure H.14: A mental experiment to assess the value of time of a person. The person has two choices: (A) to work 8 hours with certain wage W and (B) to spend X hours on zero-benefit level while the remaining 8 - X hours are free.

After the participants of the study have carefully explained these four ways of spending time they are asked to assess two questions. First, they are asked: what would be the wage (W Euros/hour) on a typical day that makes the working in the hamburger bar just acceptable?

Secondly, the participants are offered two options:

A. You will work in the hamburger bar from 8 am to 4 pm, and will get the net wage you declared above as acceptable.
B. You will spend X hours in total isolation during which you cannot do anything meaningful. You do not have any connection to the outside world, and you do not have anything to read, watch, listen to, or play with. You spend all the time in a dim room without any significant stimulus. You are only allowed to take 3 times

a 3-minute break to satisfy your basic physiological needs without interacting with any person during the breaks. You are free to use the remaining time $(8 - X$ hours) for any activity you want. You will get the same amount of money as in the option A (that is, $8 \cdot W$ Euros).

Finally, the participants are asked: how long time (X) in a total isolation makes the options A and B equally attractive for you?

Now if we make the assumption that people answer the questions in a way that is consistent with the mental framework described in Figure H.14 then we can assume that the total benefits of options A and B are equal, which means that the sizes of the areas $8 \cdot W$ and $X \cdot VoT$ shall be equal. Thus according to this experimental model value of time for a person can be approximated as follows:

$$VoT = \frac{8 \cdot W}{X}.$$

It should be noted that in this experiment, work to be considered should be sufficiently unpleasant to make it obvious that the main reason to work is to earn money. In a more credible version of this study, the participants should be provided real alternatives instead of a mental exercise. However, with a large enough group of people we may rely on the principle of wisdom of crowds discussed in Chapter A. So far, I have made this experiment on four different courses at Aalto University with altogether 116 students. A summary of the results is presented in Table H.2.

Table H.2: Results of value of time experiments at Aalto University, (2009 - 2012, N = 116).

	Average	Median
Acceptable wage (W, Euros/hour)	13.6	11.0
Acceptable period on zero-benefit level (X, hours)	2.86	2.50
Value of time (Euros/hour)	38.1	35.2

Based on these studies the value of time of a student in Finland varies between 20 Euros per hour and 60 Euros per hour. The average result of 38 Euros per hour corresponds 570 Euros per day and 17100 Euros per month (note that only 15 hours per day are included into these calculations).

We need to consider also the possibility that the method itself generates a systematic bias that makes the result unreliable. In practice, value of time, both as mental concept and as a specific number is a part of a larger construction that is either useful or not from the viewpoint of an objective. The objective might be the prediction of the behavior of communications services.

Peak-end rule

One phenomenon that a CEE must also know is the Peak-end-rule illustrated in Figure H.15. As an example, a typical method of studying the pain experienced during a medical treatment or operation is to ask afterwards how painful the treatment was. The answer may predict how willing the person is to accept a similar treatment later. The systematic observations in many studies are: people remember the most intense pain and the pain at the end of the operation, whereas the length of the operation is almost irrelevant.

As a rough estimation, the strength of remembered pain of an operation is the average of peak pain and the pain at the end of the operation. Note, however, that the characteristics of the scale are critical when the averaging is made. A scale, say, from 0 to 10 is not necessarily linear in this sense. Furthermore, we may speculate that the last part of an event can even include pleasurable emotion instead of milder pain if the person under study considers the pleasurable experience as a part of the same event. What is then the average of peak and end? You may consider, for instance, a scary riding on roller coaster: you probably remember the most intense emotion during the riding and the relief at the end of riding. The length of the riding is a minor issue when you recall the experience afterwards. Other possible questions are: "How do you assess how many rides you went on after a day at the amusement park?" and "How does the number of rides influence your overall satisfaction?" According to my intuition, the effect of the number of rides on the total experience might be modeled by a logarithmic function.

A paradoxical consequence of this rule is that it is possible to *reduce* the displeasure of an event by lengthening it with a milder pain as shown in Figure H.15 by the broken line. Remember our mind does not integrate the momentary pain over the whole duration of the event.
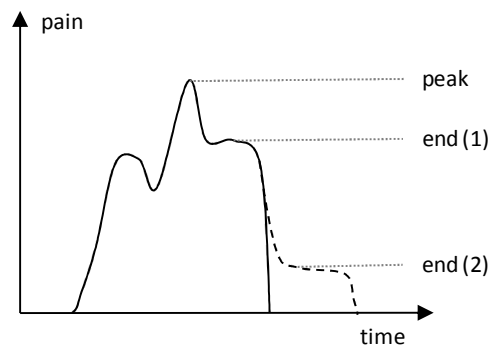

Figure H.15: Peak-end rule: original event with end (1) and prolonged event with end (2).

You may also consider the endings of movies from this perspective. According to my experience, a movie is typically assessed by three emotions: the most intense emotion during the movie, the emotion at the end of the movie, and the most prevalent emotion during the movie. These should preferably be different emotions in order to make them memorable. In American movies, the most typical emotions are intense fear, continuous excitement, and happy ending, while in a typical Finnish movie directed by Aki Kaurismäki a different set of emotions is used. The logical structure in both movie categories might still be similar.

Book recommendations

B. Fredrickson, 2009, *Positivity*, New York: Three Rivers Press.

> Why should anyone become intentionally positive? The convincing answer of Fredrickson's book is that positivity broadens your mind and gives more room for creativity: more ideas come into mind and more actions become possible. Furthermore, positive attitude improves your social relationships. All these highly desirable outcomes can be achieved based on the insight and advices given by Barbara Fredrickson.

D. Kahneman, 2011, *Thinking, Fast and Slow*, New York: Farrar, Straus and Giroux.

> If you want to understand how you are thinking, read this insightful book. Many of the issues addressed in this book (that you are now reading) are discussed much more profoundly by Daniel Kahneman. The topics include the difference between intuition and reasoning, prospect theory, and correlation.

M. Seligman, 2011, *Flourish*, New York: Free Press.

> Do you believe that you cannot be successful in your life either because of your poor economic situation or because of your limited intelligence? Forget those kinds of reasons and concentrate on what you can do to build a successful, flourishing life. Even in the era of academic world, self-discipline is more important than intelligence. Martin Seligman offers this and many other truths about human endeavor in his impressive book.

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