Meta-effectiveness Excerpts from *Cognitive Productivity: Using Knowledge to Become Profoundly Effective*

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I recently wrote a blog post containing some important concepts for understanding adult development of competence (including “learning to learn”). The overarching concept of that topic, and *Cognitive Productivity*, is *meta-effectiveness*, i.e., the abilities and dispositions (or “mindware”) to use knowledge to become more effective. *Effectance* is a component of meta-effectiveness.

The concepts of meta-effectiveness and effectance being both subtle and important, I am publishing in this document a few excerpts from my book (*Cognitive Productivity*) to elucidate them. You will notice that I am critical of the position espoused by Dennett (e.g., in *Inside Jokes*) that the tendency to think is pleasure-seeking in disguise. Also, I’ve modernized White’s concept of *effectance*, aligning it with Sloman’s concept of *architecture-based motivation*. I have also updated David Perkins’ concept of *mindware*.

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**Footnotes**

**Revision History**

Cognitive Productivity Using Knowledge to Become Profoundly Effective

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Using Knowledge to Become Profoundly Effective

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I Challenges and opportunities

*Only the ideas that we actually live are of any value.*

Hermann Hesse
1. Introduction

*The essence of knowledge is, having it, to apply it; not having it, to confess your ignorance.*

Confucius

We live in an era of ineffable opportunities to use knowledge to become more effective. The information cornucopia is at our fingertips. We are served the latest knowledge in print, ebooks, audiobooks, web pages, podcasts, videos, screen casts, webinars, and other forms.

For example, books by relationship expert Dr. John Gottman can improve your marriage and other close relationships. The principles of rationality conveyed by cognitive scientists like Dr. Keith Stanovich can help you avoid costly mistakes. Agile product-development principles conveyed by the likes of Eric Ries can help you develop products customers will actually like and pay for. High caliber investment advice from writers like TSI Network’s Pat McKeough can protect and grow your investments. Applying health and nutrition information from Center for Science in the Public Interest¹’s *Nutrition Action²* newsletter might help you live a healthier and longer life. The open-access movement provides public access to information hitherto only available to select knowledge workers. Many universities are now even offering massive, open (free) online courses—MOOCs!

To be sure, there is more irrelevant information than text worth reading, let alone delving. But there is no denying the abundance of potent knowledge to help us solve problems and develop ourselves. This bodes well for the exercise of the seventh habit of highly effective people, which—according to the late Stephen R. Covey—is to “sharpen the saw”®. It is to improve ourselves—our productive capacity—through regular reading and related pro-active activity (Covey, 2004). If we properly conduct our research and apply ourselves, then we can develop personal effectiveness: understanding, skills, attitudes, habits and dispositions. I agree with Aristotle, who laid the foundations for Western ethics, that in the balanced pursuit of excellence lies the route to happiness.

Alas “the shallows”, intellectual defeatism, naive optimism and cognitive miserliness each in their own way threaten our knowledge-based and technology-enabled pursuit of effectiveness. In his best selling book, *The Shallows*, Nicolas Carr laments the effects he supposes the Internet has on our brains, minds and behavior. He suggests that our usage of information technology causes us to have shorter “attention spans” and more difficulty learning. He claims that the distractions, hyperlinks and other features of technology (and our way of using it) not only interfere with our productive use of technology, they alter our brains and minds. “The tools of the mind amplify and in turn numb the most intimate, the most human, of our natural capacities—those for reason, perception, memory, emotion.” From the neuroplasticity bandwagon, Carr professes that our new technological vices “rewire our brains”. We are, he seems to believe, becoming inextricably stuck in the shallows.

However, Carr’s apparent defeatism overshadow his legitimate concerns. Let us “consider the opposite”, a reasoning strategy discussed below. If plasticity (i.e., modifiability) is as important a

¹http://www.cspinet.org
²http://www.nutritionaction.com
observations and data from phenomena-based researchers.³³ Ideally, they subject the concepts of their requirements analyses to conceptual analysis. (b) They produce detailed designs of systems to meet these requirements. These designs specify an overall architecture and component mechanisms. (c) They implement as much of their designs as they can in computer simulations and possibly robotic systems. (d) They analyze the extent to which their designs and implementations meet (and fail to meet) their requirements. (e) They explore and study the space of possible designs that might satisfy these requirements. This leads to the gradual re-interpretation, pruning and replacement of folk psychological concepts and the creation of new concepts.

Phenomena-based researchers test conjectures produced from the designer stance, folk psychology, and various cognitive science research programs. This book leverages pertinent empirical research. The second part of this book describes mechanisms of mind and their development from a designer-stance. Here are some of the concepts described there that are particularly important to personal development.

- Monitors that help us recognize potentially pertinent information (for example, a child develops monitors to recognize when her name is spoken);
- Inner motivators that generate new goals and evaluations (for example, a goal to slow down the vehicle as one approaches a red light);
- Long-term working memory, a form of secondary memory that people develop as they gain expertise in a domain. It has some of the properties of normal long-term memory and some of the properties of working memory (rapid access).
- Deliberate practice, a form of practice in which people engage in order to develop expertise. We are all intuitively familiar with this concept. However, outside of public performance disciplines, people tend to forget its importance. They also don’t necessarily understand how it relates to long-term working memory. **Productive practice** is a form of deliberate practice designed specifically for knowledge workers.

The first three of these concepts are forms of mindware, whereas productive practice is a way to develop effectiveness, which hinges on mindware.

### 1.2.2 Mindware

Information-processing is not simply a metaphor we use to understand the mind. It is what the mind does that is functionally important. It is what needs to be understood and modeled in order for us to make sense of mental phenomena and explain overt behavior. If we are to describe, in information-processing terms, the structures that the mind develops as people learn, we will need a...
concise expression to refer to them abstractly. The folk psychological term “memory” has culturally loaded connotations that disqualify it. We need a term for the active processors we develop, such as our monitors, motive generators, long-term working memory, and reactive processes (as described in Part 2). The generic term must not commit us to a specific type of component. Yet it must be more compact than “information-processing mechanism”. It must also be more theoretically neutral than the “agents” described in one of Marvin Minsky’s contributions to the canon of cognitive science, *The Society of Mind*.

I opt for the expression “mindware”, which was coined by David Perkins and elaborated by Keith Stanovich. Mindware is the brain’s analog to a computer’s software. Like software, it comes in very different forms. It includes information processed in the mind, mechanisms to process information, mental representations, and even information architectures. Of course, mindware is only metaphorically related to software. Please do not assume I am (or that any serious AI researcher is) drawing a naive analogy between computers and minds.

Mindware is cognitive science’s analog to matter in physics. Some physicists indicate that they are not really sure what matter is. Their models of matter change. But (so far as I know) they do not give up on there being matter. Cognitive science (as an information processing science) is a much younger science than physics. It seeks to explain higher-level phenomena. And so the concept of mindware, understandably, is still quite nebulous. It can, however, already benefit from the work of tens of thousands of cognitive scientists in addition to computer scientists and software developers outside of AI. The latter have studied countless types of information-processing systems that may be relevant to understanding mindware.

I find it strange that the term “mindware” has not yet been widely adopted in cognitive science. However, I suppose it is just a matter of time before it or some other candidate for the concept takes off. For it is very convenient to have a term to refer to this important concept.

### 1.2.3 Adult mental development

*adult intellect is expected to grow over early and middle adulthood*

Phillip L. Ackerman

This book describes a way of thinking about the development of competence. This usually falls under the umbrella term “learning”. However, Carl Bereiter has convincingly argued that the term “learning” is over-used and misleading (Bereiter, 2002a). There is such a variety of changes called learning that the expression is meaningless. A unicellular organism can learn in some sense. The most important distinction the term blurs is between the creation of objective knowledge and changes in mindware.³⁴ The distinction between objective knowledge and mental representations is not that knowledge is unbiased—knowledge can even be false. Rather, it’s that objective knowledge is potentially public. In some cases, objective knowledge is also negotiable. For example, one can buy, sell and license patents and copyright material. You can’t do that with your mental states, processes and mechanisms. While this may seem like an esoteric distinction, Bereiter has shown that blurring it is the source of much confusion.

³⁴See Popper (1979). I elaborate on these distinctions in chapter 5. They relate to Bereiter’s distinctions between learning and knowledge building.
People often behave as if processing information guarantees they will be able to use it later. Yet new competencies do not often develop from knowledge resources as quickly or as passively as is common under associative learning paradigms such as classical (Pavlovian) conditioning and (Skinnerian) operant conditioning. (See the section Illusions of Meta-effectiveness.) Whether we are developing skills, understanding, habits, or simply an ability to recall information, a large number of mental changes must occur. Thinking about this as some kind of amorphous learning, or merely using the behavioral concepts of skills and habits, draws our attention away from the mechanisms that change as we learn.

Thinking of learning in terms of mental (i.e., mindware) development draws us back inside. We don’t know exactly what happens mentally, let alone neurally, as we learn. But I suggest that we can benefit from using a broad and deepening theory of what happens when we grasp knowledge. This theory will draw our attention to the varied constituents of our mental development. It will involve hypothesized mental components such as monitors, inner motivators and long-term working memory. This way of thinking is also meant to help us choose ways of processing information that are more likely to deliver desired “learning outcomes”.

Whatever theory of mind we espouse, many of us are accustomed to thinking of child development. People are much less apt to speak of adult mental development. We think of child development as a genetically unfolding program. However, developmental cognitive psychologist Annett Karmiloff-Smith has shown that epigenetic factors are very important in child development (Karmiloff-Smith, 2012). In a knowledge society, variability in adult development is largely a function of people’s interactions with knowledge. The minds of effectant people develop significantly over their lifetime, as a function of the knowledge resources they delve and master. The differences in mental functioning and performance between an expert and a novice (at least with respect to their domains of expertise) are as remarkable as the most striking differences between a young and older child. Effectant people’s mindware is programmed, and their mental architecture developed, with the knowledge resources they master.

1.2.4 Effectance: motivation for competence

Sustein is one of the foremost legal scholars in the United States, and shares with other leaders of his profession the attribute of intellectual fearlessness. He knows he can master any body of knowledge quickly and thoroughly and he has mastered many, including both the psychology of judgment and choice and issues of regulation and risk policy.

Daniel Kahneman

As I mentioned above, Robert White (1959) coined the term “effectance” to make sense of the cognitive properties of children’s play. He attempted to fill conceptual gaps of two schools of thought, behaviorism and psychodynamics, that continue to limit our thinking about cognition.

There is a competence motivation as well as competence in its more familiar sense of achieved capacity (p. 318) […] Such activities in the ultimate service of competence must therefore be conceived to be
motivated in their own right. It is proposed to designate this motivation by the term effectance, and to characterize the experience produced as a feeling of efficacy.

Expounding the concept of effectance, White emphasized the child’s need to learn to systematically influence the environment. He drew attention to the interest and curiosity displayed by children.

The concept of effectance is of tremendous importance to knowledge work and personal development. White’s term never made its way into dictionaries and is only infrequently cited in the psychology literature. Waytz et al. (2010) are an exception. They defined effectance as “the motivation to attain control, predictability, and understanding, and to reduce uncertainty, unpredictability, and randomness.” (p. 424). They noted that the concept is important to make sense of much research, including on: sense-making, need for closure, desire for control, locus of control and, I would add, thinking dispositions and perceived self-efficacy. Absent a term for effectance, however, we are prone to overlook some of the major reasons why some people progress more than others (and more at some times than they did previously.)

While White’s concept of effectance is a useful starting point for understanding the factors that drive people to improve themselves, it has a weakness. In chapter 3, I put forward a more subtle, parsimonious and powerful concept of effectance.

1.2.5 Meta-effectiveness

*Human language, and human culture, are not instincts—but they are instincts to learn*

W. Tecumseh Fitch

With these concepts in place, we can revisit meta-effectiveness. Meta-effectiveness refers to the skills, dispositions and manifold underlying information-processing mechanisms that enable and drive people to improve themselves. It includes both fluid expertise and effectance. Fluid expertise is the ability to develop expertise (Bereiter & Scardamalia, 1993); it includes learning skills as distinct from one’s inclination to apply them. The concept of meta-effectiveness exemplifies a key tenet of this book: the folk psychological distinction between motivation and abilities fades when we adopt the designer-stance. This will become clearer when we take a closer look at information processing in Part 2.

Many knowledge workers have easy access to useful high caliber knowledge. The major bottleneck in the development of personal excellence, for them and many others, is converting this knowledge into mindware. Meta-effectiveness is the width of this bottleneck. It enables and motivates individuals to release the potential of objective knowledge in themselves. It involves mindware that potentiates objective knowledge, further generating and developing mindware.

The most potent ways in which knowledge workers improve themselves are through delving knowledge, progressive problem-solving, knowledge building, reflecting-in-action, deliberate practice, deliberate performance.

- Delving refers to attentive, deliberate processing of knowledge resources (e.g., reading, attending seminars meetings, lectures and workshops, listening to podcasts, watching videos).
Progressive problem-solving refers to addressing and attempting to resolve increasingly difficult problems (Bereiter & Scardamalia, 1993). It entails working at the edge of one’s competence, as opposed to simply trying to reduce effort, be efficient, and “get things done” in the short run.

Knowledge building refers to creating, improving and assessing objective knowledge in response to problems of understanding (Scardamalia & Bereiter, 2006).

Deliberate performance refers to deliberately practicing skills on the job, i.e., while accomplishing things.

Deliberate practice involves purposefully practicing, offline.

Reflecting-in-action involves thinking about one’s work, and improving it, while one is doing it (Schön, 1983).

Productive practice is a form of deliberate practice in which one uses (and potentially builds) knowledge to develop personally (to become more effective).

These activities are not completely orthogonal. For example, productive practice and progressive problem solving often involve knowledge building. Schön also described multiple types of practice (Schön, 1982). More importantly, the mental processes involving these activities overlap in ways that can be analyzed. (For example, the process of representational redescription (Karmiloff-Smith, 1995) can be invoked in all of these activities to develop mindware and improve one’s effectiveness.) Of these activities, this book focuses mainly on delving and deliberate practice (in the form of productive practice).

1.3 Example knowledge resources referenced in this book

As we will see in chapter 7, meta-effective people like to use examples to drive their learning. They also process them more carefully (VanLehn, 1996). Therefore, I’ve loaded this book with examples. In particular, I refer to four sets of knowledge resources that are likely to be pertinent to my readers. They illustrate a wide variety of types of effectiveness you might seek. They are the following:

- Various works by Aaron Sloman and myself (including this book).

35http://www.gottman.com/shop/7-principles-for-making-marriage-work-2/
36http://www.gottman.com/shop/the-relationship-cure/
37http://www.keithstanovich.com/Site/Books.html
38http://theleanstartup.com/book
One reason we sometimes fail to benefit from what we have learned is that we don’t always meaningfully abstract the structure of the problem and its solution. In other words, it’s not that we fail to apply what we know, but that we don’t learn properly in the first place. We often fail to analyze (and name) the type of problem and solution we are facing. I referred to the Ray and General problems as calling for a “divide-and-conquer in parallel strategy”, which is a type of divide-and-conquer strategy. If you’ve already dealt with many similar problems in abstract terms, you might quickly apply such a label yourself. Otherwise, it might take some time and effort to detect and label the pattern. When you perform this kind of cognitive task in preparing for future problem solving, you are engaging in “forward-reaching transfer” (Perkins & Solomon, 1987). Here, you are trying to construct personal knowledge that you can apply (“transfer”) to future similar cases. Forward-reaching transfer is something we strive for with all kinds of information that we learn. (It requires a rational processing mindset.) To deeply process this information, I recommend you identify a book or document that you had carefully read that might have helped you with a recent problem but didn’t. Why did you fail to use the knowledge?

The backward- and forward-reaching characterization of transfer are examples of the structure-matching approach. Structure matching goes like this: discover the structure of a prior problem (i.e., the structure of both the initial and goal conditions, and the mapping between them); discover a solution and express it in abstract terms (e.g., divide-and-conquer in parallel strategy). Then notice, in the future, when a given situation matches the prior problem’s structure; when it does, consider applying the prior solution in its abstract form. Structure matching calls for some heavy thinking up front, and sophisticated pattern-matching at “run time”.

Alas, this approach does not capture all failures to apply what we know. A problem with this rather schematic characterization of transfer is that it under-emphasizes some of the most important mindware we develop as we become more effective. That is a web of fine-grained mental mechanisms, many of which are perceptual. The perception is not so much of the external environment as it is of the mind. Often, the reason we fail to apply knowledge is that we fail to detect that it is pertinent. It’s as if all we need is a hint, like the students who were prompted to consider the story, “The General”. But we must provide the hint ourselves! Asking ourselves “what relevant prior knowledge can I bring to bear on this problem?” won’t necessarily be enough (though it may help). Something has to happen to our internal perception in between forward-reaching and backward-reaching processing.

To understand transfer failures (and the breakdowns in rationality they entail), we need to refer to a blue-print of the mind, one that starts to make sense of successes and failures of learning. This will enable us to pinpoint some of the mental mechanisms that fail to develop in cases where we systematically fail to apply the knowledge we “acquired.” We also need a relational concept of understanding. For there is more to “transfer” and knowledge-based rationality than applying concepts and skills. We will turn our attention to these matters in Part 2. Chapter 14 describes ways of practicing that increase the likelihood that we will apply what we know.

### 3.3.3 Cognitive miserliness and its antagonists

I’m sorry Darling you are disappointed at the sale of the Book [The Arms and the Covenant]. I’m sure it’s the price—The sort of people who want to hear that the
Government is all wrong are not the rich ones —The Tories don’t want to be made to think.
Clementine Churchill to Winston Churchill

Even with the ideas and tips in this book, using knowledge to become a more effective person requires a lot of effort. Meta-effectiveness makes personal development easier, not easy. One must fight the temptation to passively process information. Rather, we must actively seek the best information, process it carefully, think about and with it, and practice it, whether deliberately or implicitly. This requires thinking dispositions that most people lack, propensities that are at odds with what Keith Stanovich refers to as “cognitive miserliness”, a concept he introduces as follows:

Consider the following problem, taken from the work of Hector Levesque and studied by my research group. Try to answer before reading on:

Jack is looking at Anne but Anne is looking at George. Jack is married but George is not. Is a married person looking at an unmarried person?

A) Yes
B) No
C) Cannot be determined

Answer A, B, or C before you look ahead. (Stanovich, 2009)

http://www.keithstanovich.com/Site/Books.html

I’ve tucked the answer to this question and a brief explanation of the data in this footnote to prevent you from accidentally reading it. While solving this problem does require a certain level of fluid intelligence, IQ does not explain the fact that 80% of participants get this wrong. They were all smart enough to answer the question correctly; but the cognitive misers amongst them eye-balled the problem and then quickly selected an incorrect answer. This shows that smart people shouldn’t expect to be able to coast through life based on their high IQ. Fluid intelligence is of little use if one can’t be bothered to think.

Most people, at first blush, don’t see a way of proving “yes” or “no”. A way to answer this question is to consider that Anne may be married or unmarried. Most people then seem to suppose that because Anne’s marital status is not given, the problem cannot be solved. And so they answer “C”. This is the easy way out. For one could instead wonder and logically investigate the implications of Anne being married. If she is married, then a married person (Anne) is looking at an unmarried person (George). One could then continue to wonder what follows in the case where she is not married. One may then conclude that a married person (Jack) is looking at an unmarried person (this time, Anne). To solve this problem in this way requires that one consider hypothetical possibilities, store them in memory, draw inferences, and reason about them. That’s cognitively demanding.

In Part 3, I give an example of how the concept of cognitive miserliness can be learned with productive practice.

Many factors can affect the answer one gives to this question; one must therefore not read too much into a wrong result on one question. Stanovich (2011) calls for the creation of psychometrically valid tests to measure one’s “rationality quotient (RQ)” (p. 246).
Challenges to meta-effectiveness

What does this mean for developing personal effectiveness from knowledge? Think back to Janet of Water Flop. Her high IQ will certainly help her to solve problems when she applies herself. She might even tend to process reams of information. However, she also tends to shoot from the hip. She does not seek out the best knowledge resources nor does she effortfully try to apply them in her day-to-day problem-solving. Many of her former classmates who invest more effort in developing themselves, even those with lower IQs, have long since become more effective than she is. As a result, their teams also perform better and they are more often consulted for their expertise.

On the one hand, it is helpful to keep in mind the dangerous allure of cognitive miserliness; but on the other, one ought not to depend too heavily on negative self-talk and duty (to avoid cognitive miserliness). Besides, conservation of mental resources is important. It is difficult to nurture the dispositions required to do the necessary demanding, sometimes dry, cognitive work if we cannot even name and describe them. We need positive language to express the affective underpinnings of our cognitive pursuits. Effectance, perceived self-efficacy and thinking disposition are helpful concepts for our pursuit of knowledge-based excellence.

3.3.3.1 Effectance as a propensity to develop competence

Helen [Keller] did not come by her knowledge easily. Everything she did was so difficult that most people would have given up early in the learning process. But she worked furiously at mastering all she encountered.

Merlin Donald

In chapter 1, I introduced White’s concept of effectance: the motivation to develop competence. However, I use the term in a subtly different way than is normally used, namely as the often tacit propensity to develop competence. The key difference is that this propensity does not necessarily involve explicit (let alone conscious) motivation for competence. I also emphasize the role of objective knowledge in adult effectance. This new concept of effectance is more subtle and more powerful. It is based on an architectural concept of motivation, which comes from “designer-based” Artificial Intelligence.

White always qualified the term “effectance” with “motivation” or “urge”, as in “effectance motivation”. In so doing, he vitiated his own neologism. I suspect this is why it is not in common currency. There is no use for the term so qualified; one might as well use the phrase “competence motivation”. Moreover, as I argue below, the compound use of “effectance” betrays a folk-psychological notion of motivation which, though it is for all intents and purposes the only one used in psychology, needs to be superceded with an architectural, designer concept (cf. Part 2). So, I use the term “effectance” by itself and in adjectival form, “effectant”.

Concepts similar to effectance have shown up many times in cognitive science—but without an adequate label. Carl Bereiter and Maria Scardamalia provided an insightful analysis of the
processes of expertise (Bereiter & Scardamalia, 1993). They did not merely focus on differences between experts and novices. They sought to explain how people acquire and lose expertise. They drew attention to critical similarities between “expert-like novices” and experts. At every level of competence, there are some people who have more fluid expertise than others. Fluid expertise is a major component of meta-effectiveness. It is distinct from effectance.

As people gain crystallized expertise, they become more efficient. Fluid experts reinvest the temporal gains of these efficiencies in learning and progressive problem-solving. Thus, they further develop their expertise. Bereiter & Scardamalia stressed the importance of the underlying propensity to develop. However, they did not name their motivational concept. The concept of effectance, as I have adapted it, designates the underlying motivational processes. We can attribute effectance to people using the intentional stance and explain it with the designer stance (i.e., an architecture-based theory of motivation). Effectance is the propensity to develop competence. One need not be an expert to be effectant. But without effectance one cannot indefinitely sustain the development of expertise. The motivational processes underlying what Bereiter and Scardamalia called “reinvestment” deserves its own name (effectance) and further characterization.

Gopnik, in her paper “Explanation as orgasm”, reinvented White’s evolutionary explanation for effectance (Gopnik, 1998) without referencing White or using the term “effectance”. She posited a theory drive, “a motivational system that impels us to interpret new evidence in terms of existing theories and change our theories in the light of new evidence”. (p. 101) This is not identical to White’s effectance. For parsimony, rather than introduce a brand new concept, I extend White’s concept of effectance to accommodate Gopnik’s data and other manifestations of effectance described in this book. I want the meta-effectiveness framework to avoid the fate of instinct theory (e.g., William McDougall’s proliferating list of instincts).

There is also a vast literature on thinking dispositions that is relevant to effectance. Stanovich and his colleagues have developed a taxonomy of rationality involving thinking dispositions (Stanovich, 2011; Stanovich, et al, 2011; Toplak, West, & Stanovich, 2012). The “need for cognition” is particularly relevant to effectance as are various factors related to curiosity (Aubé, 2005).

The concept of motivation for increased competence shows up in the psychology literature in different forms. The term “effectance”, however, is only rarely used. Moreover, it has never previously been used with the specific meaning I develop here, i.e., one that is grounded in designer-based cognitive science research (Beaudoin, 1994; Sloman, 2010c). In fact, the general concept of motivation described here is not widely known in the psychology literature or elsewhere. Yet it’s impossible to understand and promote the pursuit of excellence without such a concept.

It has become customary in attempts to account for competence-motivation (effectance) to invoke Csikszentmihalyi’s concept of “flow”.⁵³ “The concept describes a particular kind of experience that is so engrossing and enjoyable that it becomes autotelic, that is, worth doing for its own sake even though it may have no consequence outside itself.” (Csikszentmihalyi, 1999, p. 824.) Csikszentmihalyi provides as an example of the state of flow a composer’s account of writing music

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⁵²Bernard (1924) painstakingly identified over 14,000 alleged instincts in the social science literature. The doctrine of instincts is not particularly parsimonious.

⁵³For example, Bereiter and Scardamalia appeal to flow in their explanation of “fluid expertise”.

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exist. I’ve experienced this time and time again. My hand seems devoid of myself, and I have nothing to do with what is happening. I just sit there watching in a state of awe and wonderment. And the music just flows out by itself. (Csikszentmihalyi, 1975, p. 44)

Work becomes as Stuart Brown concisely describes play⁵⁴ (Brown & Vaughan, 2009):

A “Goldi Locks” state of peak performance, wherein one addresses a difficult but not insurmountable challenge and feels a sense of timelessness and selflessness, as if the activity was done for its own sake.⁵⁵

Alas, the fact that a concept is commonly invoked to explain a phenomenon does not entail that it is productive. While, as I described elsewhere (Beaudoin, 2014b), I do not doubt that most knowledge workers can relate to and enjoy the experience of flow, the theory of flow betrays a nearly universal yet false assumption in colloquial and scientific accounts of behavior. It is essentially hedonism, that people do things because they enjoy either the feelings the behavior elicits or some other aspect of the state of performance.⁵⁶ More generally, that we are driven by the “law of effect” (reinforcement and punishment). I don’t believe knowledge workers are seeking a fix (“flow”).⁵⁷ Moreover, even if flow had the powerful motivational effects that Csikszentmihalyi claims, it would not be of great use to promote it—pleasure seeking tends to take care of itself. Thus, the explanation of effectance is not flow and the concept of flow has very little explanatory power.

The explanation for effectance, like the drive to mate, is instead evolutionary, as White alluded to with respect to children’s play. That is to say that the motivation for competence in humans throughout our evolutionary history provided a reproductive advantage.⁵⁸

However, here lies a rarely noted subtlety. Effectance ought not to be understood as a single, top-level drive, goal or motivator.⁵⁹ Nor do our inclinations towards behaviors that increase our competence necessarily involve explicit and conscious representations of competence (e.g., goals to become more competent). Instead, it is reasonable to assume that people have mechanisms that

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⁵⁴The psychological properties of play are described in a concise, informal book (Stuart Brown & Vaughan, 2009). For a development perspective on play see Pellegrini (2013). For ways to use play (and implicitly, flow) to decrease sleep-onset latency, see Beaudoin (2013, 2014a). The latter paper applies the theory of mind described in Part 2.

⁵⁵Compare Campbell’s (2008) interview of Stuart Brown.

⁵⁶Gilbert Ryle criticizes the notion that people do things for the feelings those things give them (Ryle, 1949). Csikszentmihalyi implicitly applies Ryle’s argument (without referencing Ryle) when he states “Being happy would be a distraction, an interruption of the flow” (Csikszentmihalyi, 1999, p. 825). Csikszentmihalyi acknowledges that flow is not the only motive for behaviors that elicit flow. However, he assumes that flow is an intrinsic motive, without distinguishing between two dimensions of intrinsic motivation: internal vs. external to the agent, and derivative vs. intrinsic value goals. Compare the discussion of functional autonomy in Beaudoin (1994) and Allport (1937, 1961). See also Sloman (2009b).

⁵⁷Hedonism is still alive and kicking in cognitive science: “Higher cognition in its many forms—what it means to think like a human—is simply the chasing of the pleasures and the avoidance of the pains that are supplied by this eclectic group of cognitive, but of course ultimately neurobiological, emotions.” (Hurley et al., 2011) I believe this is false. Moreover, it is incompatible with the architectural view of motivation. See Erber & Erber (2001) and chapter 5 of Frijda (2007) for related arguments against hedonism.

⁵⁸The thoughtful theory of humor recently proposed by Hurley, Dennett and Adams also implicitly hinges on the concept of effectance (Hurley et al., 2011). (In particular, see their sixth chapter). They expatiate about evolutionary bases for thinking dispositions comprising fluid rationality (Stanovich, 2011). However, they do not use the terms effectance, fluid rationality or thinking disposition. (They do not refer to White’s work or that of Stanovich.) I believe their theory would have been easier to communicate with the concept of effectance and thinking dispositions. They further fail to draw necessary distinctions between motivational and emotional states, distinctions which become apparent when one explores the architectural basis for motivation, as described below. I make some of these distinctions in chapter 5 and 6. See also Sloman (2003) and discussions of the work of Andrew Ortony below.

⁵⁹However, a person can, of course, form explicit goals to increase competence. And this can lead them (unconsciously) to create motive generators that when acted upon increase their competence.
lead them to produce goals the pursuit of which will or may directly or as a side-effect improve their competence.⁶⁰ One normally delves a paper to better understand it and to use it for building knowledge or solving a problem. One does not necessarily engage in this behavior for the explicit or otherwise unconsciously operating motive of improving one’s competence. Yet delving can develop one’s effectiveness and so it reflects our implicit effectance.⁶¹ More generally, the human mind can generate top-level goals as a reflex without deriving them from means-ends analysis, planning or other deliberate processes. I call these “reactive, intrinsic motives”.⁶² A motive whose pursuit improves one’s effectiveness is not necessarily seen, felt or otherwise represented in the mind as a means towards effectiveness.

Thus, effectant motives are not simply aimed at flow.⁶³ Nor are they normally aimed (even unconsciously) at improving effectiveness. For one to be effectant is to have mechanisms that produce top-level goals (i.e., goals that are treated as good in themselves) the pursuit of which leads (or tends to lead) to the development of competence. Effectant people implicitly inherently value competence.

Having dealt with this special case, I acknowledge that people can become more effectant by becoming conscious of their effectance and by valuing effectance. From a practical perspective, effectance, while natural, can and ought to be nurtured. It can lead to the intrinsic benefits cataloged in the previous chapter. They, in turn, tend to lead to the external consequences and reward of competence that do not need to be explicitly cataloged here.⁶⁴

Effectance, considered this way, calls for a characterization of motivation in terms of the architecture of the human mind. That is to seek the explanation of effectance not in terms of its consequences (rewards or pleasure) or functions but in terms of the mechanisms that give rise to our ascriptions of it. The designer-based concept of effectance can lead us to inquire into the information processing substrate of motivation. In addition to any overarching, explicit drive for effectiveness, there are myriad mechanisms that generate all kinds of motives to behave in ways which increase effectiveness, even though the agent is not explicitly or even unconsciously seeking to become more effective. The architectural basis of motivation and other affective states is briefly described in chapter 5.

Thus, while the concept of flow is of some value, the concept of effectance is of greater theoretical and practical significance with respect to motivation for competence. Its theoretical

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⁶⁰This is a special case of the argument for architecture-based motivation (Sloman, 2009b). Evolution cannot guarantee that a motive generator will necessarily create motives that provide a selective advantage. Motive generators evolve because they tend to produce an advantage often enough, which might be very rarely. “The main point [of architecture-based motivation] is that the individual concerned has no information about [the benefit provided by this type of motive], not even implicit information (unless the individual is a biologist who starts asking ‘Why do I have these motives?’)” (Sloman, 2013b).

⁶¹“Implicit” does not mean “unconscious”.

⁶²In Part 2, I refer to deliberation processes as management processes. There, we will see that “reactive motives” stem from asynchronous motive generators—reactive mechanisms.

⁶³White’s paper could also be criticized for emphasizing the feeling of competence, though the emphasis there is not as strong. It can also be criticized, along with much literature on affect, for characterizing affect as a matter of feelings. The architectural model described below does not emphasize (or deny a role for) feelings of competence or flow, and yet it does not depend on the rather unparsimonious assumption of the pursuit of pleasure. See also chapter 6 of Beaudoin (1994); Sloman (1987, 2009b).

⁶⁴Peter Brems (personal communication, February 21, 2015) distinguished two types of effectance: propensity to increase a specific competence and propensity to become better at improving oneself (such as by mastering new learning strategies). He suggested we call the latter “meta-effectance”. Understandably, however, most readers are resistant to neologisms and even more to recursive concepts. Moreover, the concept of architecture-based motivation blurs the distinction between competence and motivation. I would be content were the terms “effectance” and “meta-effectiveness” to enter common parlance. So, in this book I stick to these overarching terms.
advantages are implicit in my criticism of the concept of flow. Having a term for this important
construct (effectance) may promote both our understanding of meta-effectiveness and the practical
development of effectance.

To summarize the admittedly complex and uncommon ideas presented in this section:

- Humans are capable of generating top-level motives that are not derived from other motives. These “reactive motives” do not necessarily serve any other motive, drive, or purpose. They are not necessarily driven by implicit considerations of reward, punishment, pain, pleasure or “flow”. They may have intrinsic value.
- Effectance refers to a person’s propensity to develop effectiveness.
- The concept of effectance applies both to cases where an agent engages in behaviors (a) for the deliberate goal of becoming more effective; (b) that viewed from the intentional stance promote effectiveness but that (i) were not explicitly spawned in pursuit of effectiveness and (ii) do not explicitly code for the pursuit of effectiveness (or its consequences).
- Effectance is not necessarily explicit motivation for competence; however, it is motivation that tends to develop one’s competence.
- Effectance is thus the motivational underpinning of meta-effectiveness.

Deliberately nurturing one’s effectance may help improve one’s effectiveness.

3.3.3.2 Perceived self-efficacy

One must strike a balance between arrogance and underconfidence.

Douglas Kennedy

Effectance is predicated on perceived self-efficacy. Believing one inherently is unable to succeed in a domain has been shown to affect performance in a wide variety of areas: work performance, academic performance, health, etc. (Bandura, 1997). Perceived self-efficacy is one of the most researched phenomena in psychology. It ought not to be confused with self-esteem, self-concept or “locus of control”. If a person believes she is inherently incompetent in one area (such as mathematics), it will directly affect that area without necessarily affecting another (e.g., writing). Consider, for an ironic example, the psychologist who sees herself as quite competent in helping children improve their perceived self-efficacy yet who sees herself as being inept with computers. She does not realize it, but her assumption that she is “simply not a computer person” makes it difficult for her to (want to) keep abreast of the literature.

I deliberately chose the example of perceived competence with technology because I believe it is one of the most wide-spread self-limiting attitudes people contend with, even young knowledge workers. By failing to become more proficient with technology, highly intelligent people also limit their meta-effectiveness.

The mechanisms by which perceived self-efficacy affect performance are easy to comprehend and compelling. Wood & Bandura (1991) report that perceived self-efficacy in a domain affects:

1. the activities and environments we choose (people tend to avoid activities at which they expect to perform miserably);
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