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Developing Personal Mastery in Systems Thinking

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Keywords: personal mastery | atomic structures | cognitive jigs | sliders | molecular structures | compound structures | systems thinking | DSRP | frameworks | problem solving | metacognition

Abstract: Senge (1990) first popularized the term ‘personal mastery’, but neglected to include the majority of the systems thinking, opting instead to equate systems thinking with a single framework (system dynamics). Thus ‘personal mastery in systems thinking’ became little more than ‘personal mastery in systems dynamics.’ Three factors lead us to conclude that the prescribed path to personal mastery in systems thinking must change significantly. This chapter posits that ‘personal mastery’ is reflected in the attitudes, skills, and dispositions required of an individual systems thinker (a.k.a., personal mastery). It also sets forth a clear path—made up of three levels—that one can follow to develop personal mastery of systems thinking.

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Personal Mastery Then and Now

Personal Mastery (c. 1990)

In what is perhaps the most *popularized*¹ version of systems thinking, Dr. Peter Senge elucidates the importance of personal mastery and its connection to systems thinking in *The Fifth Discipline*. Senge explains that ‘Personal Mastery’ is the phrase we use for the discipline of personal growth and learning. People with high levels of personal mastery are continually expanding their ability to create the results in life that they truly seek [1].” He continues:

“People with a high level of personal mastery share several basic characteristics. They have a special sense of purpose that lies behind their visions and goals. For such a person, a vision is a calling rather than simply a good idea. They see current reality as an ally, not an enemy. They have learned how to perceive and work with forces of change rather than resist those forces. They are deeply inquisitive, committed to continually seeing reality more and more accurately. They feel connected to others and to life itself. Yet they sacrifice none of their uniqueness. They feel as if they are part of a larger creative process, which they can influence but cannot unilaterally control. People with a high level of personal mastery live in a continual learning mode. They never ‘arrive.’ Sometimes, language, such as the term ‘personal mastery,’ creates a misleading sense of definiteness, of black and white. But personal mastery is not something you possess. It is a process. It is a lifelong discipline. People with a high level of personal mastery are acutely aware of their ignorance, their incompetence, their growth areas. And they are deeply self-confident. Paradoxical? Only for those who do not see that ‘the journey is the reward.’”[1]

Senge wrote about personal mastery somewhat poetically at times. But his poetry exists in the context of his extended work on systems thinking in *The Fifth Discipline* and *The Fifth Discipline Fieldbook* [2]. For Senge, ‘systems thinking’ is synonymous with the teachings of a popularized form of a framework called ‘System Dynamics,’ or ‘SD,’ which includes such concepts as balancing and reinforcing feedback loops and stocks and flows, etc. So one could conclude that Personal Mastery, stated succinctly, is all of the things Senge describes—such as

¹ One caveat, popularized literally means popular (i.e., the most well known).

“continually expanding their ability to create the results in life that they truly seek”—that a skill and competence in System Dynamics can produce.

The problem with this definition of personal mastery—a definition almost entirely based on the single framework of system dynamics, is two-fold. First, even in 1990, there existed many more frameworks and systems ideas than system dynamics. The entirety of complexity, for example, developed at the turn of the century by notable systems scholars (e.g., , Bogdonov [3], von Bertalanffy [4], Angyal [5], Weiner [6], Ashby [7], Weaver [8], and Prigogine [9]) and increasingly more relevant today than ever before, is absent in its influence on the personal mastery of the 1990s. As we will see, the recognition of a much wider boundary of what constitutes systems thinking as well as new discoveries as to the universal patterns that underlie systems thinking (DSRP Theory) means that our understanding of what constitutes personal mastery needed to evolve. And evolve it did.

Personal Mastery (c. 2000)

By the year 2000, ‘personal mastery’ in systems thinking changed from Senge’s 1990 treatment. This change was brought on by two notable events: (1) the expansion of the boundary of systems thinking, and (2) the discovery of universals of systems thinking (DSRP Theory) [10–13]. A conceptual framework called the ‘Midgley, Francois, and Schwartz Universe’ or ‘MFS Universe’ was developed in 2003 [11,14] to provide an answer to where the boundary of systems thinking could be drawn. The MFS Universe was a bounded universe of all of the nearly 5000+ different methods, concepts, and frameworks of systems thinking.

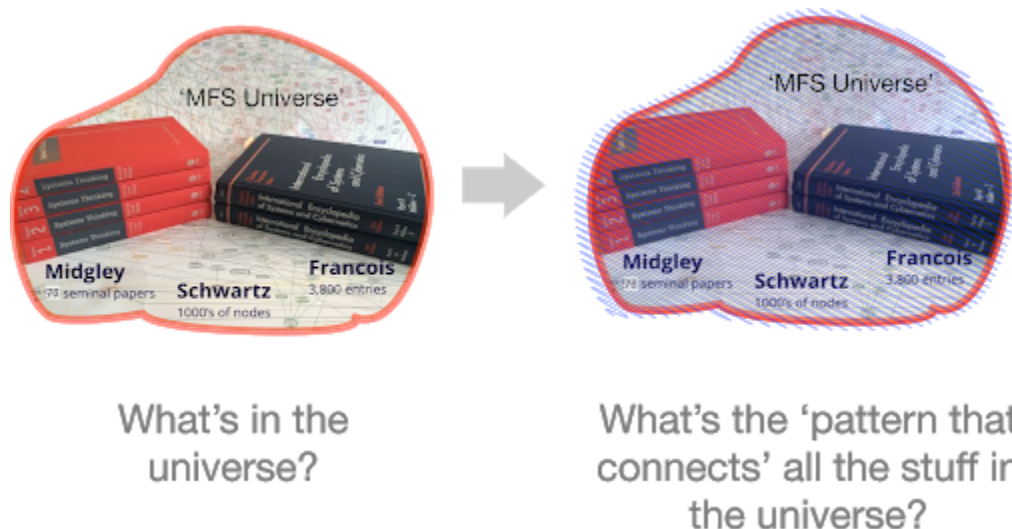


Figure 1: The MFS Universe of over 5000 different methods, concepts, and frameworks of systems thinking.

The notion of the MFS Universe casts a wide net (or creates a 'big tent') to include all of the pluralistic ideas of systems thinking. This necessitated the identification of universal patterns of thought and structure (i.e., DSRP) that underlie these systems concepts. At the time, if you had asked how to study systems thinking as a field and a practice, the answer would have included: (1) gain a deep understanding of DSRP, and (2) begin to explore (one by one) the multiple methods, frameworks, and ideas in the MFS Universe. At that time, the field consisted of people and problems, who were utilizing the various frameworks in the MFS Universe—all of which were derived from the universal atomistic structures, DSRP (as shown in Figure 2).

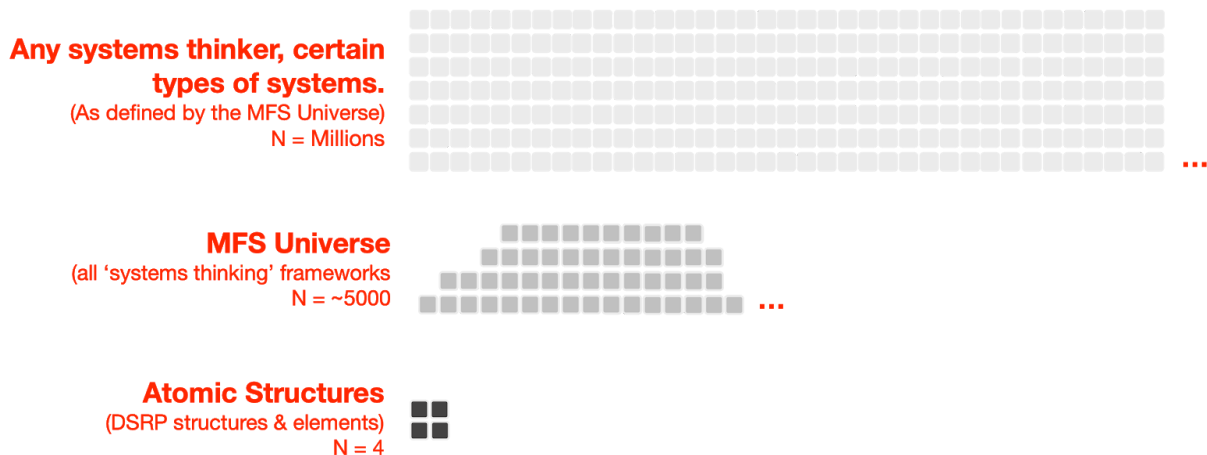


Figure 2: Personal mastery circa 2000: DSRP + the MFS Universe.

The first task, learning DSRP, was reasonably simple because it could be learned in minutes and practiced for a lifetime. Knowing each framework in the field required more time investment to learn and practice. Notably, while any *one* framework was good at some things, it was insufficient in others. Thus, any given problem required a *multitude* of frameworks (e.g., system dynamics and soft systems methodology, and critical systems thinking) that were then combined into a mixed-method solution.

This posed two fundamental problems: (1) it required a great deal of initial investment on behalf of the newcomer to systems thinking, and (2) the mixed-method solution was invariably not ideally suited to the problem-solving or system-understanding at hand². In other words, even when mixing methods from the MFS Universe, the resultant solution never quite fit the problem. Especially in a VUCA environment, unique problems and systems often require customized solutions. In today's VUCA world, bespoke models are usually the only option for solving difficult or wicked problems. That's why starting with the first principles (DSRP) allows for the 'mix and match' modularity needed to build custom solutions from scratch. Although it was not

² We use the term 'problem or system' as shorthand to refer to 'problem solving' or 'systems understanding'. Usually, people interested in systems thinking are either trying to understand a given system, solve a particular problem or both.

always the case, the combination of the significant time commitment required and the resulting ill-fitted solution made the statistical odds of ‘success with systems thinking’ relatively low. Something needed to change, or newcomer adoption would be the first casualty.

Newcomer adoption wasn’t the only issue. First, an increasingly VUCA world required increasingly bespoke solutions, and therefore greater adaptivity and fluidity in one’s personal ‘problem solving’ tool bench. Second, the discovery of DSRP Theory opened up new research directions and possibilities into the essential nature of mental models and the essential differences among them based on a ratio of their specificity in both information-content to structure. Third, DSRP Theory also expanded the boundaries of what constitutes systems thinking again. In other words, we could now ask more than, ‘which systems thinking scholars and forms of scholarship (frameworks) comprise systems thinking (i.e, the MFS Universe)?’ But rather, ‘what types of people are thinking about what types of systems in what types of ways (generally speaking)?’ These three events led to the need for another punctuated evolution to occur in what constitutes personal mastery.

VUCA Systems and Problems Require An Adaptive Toolbench

In the 30 years since *The Fifth Discipline* was published (1990), both systems thinking and personal mastery have changed. When *The Fifth Discipline* was published 30 years ago, the internet was in its infancy. The very first internet browser was created by Tim Berners Lee in the same year (1990) and Netscape, the browser that popularized what most people think of as the internet, wouldn’t exist for another four years (1994). Amazon, too, was founded four years later (1994). Today’s world is more globalized, as a result of the increasing interconnections and it is therefore more VUCA³ than ever before.

As a result, the problem solvers toolkit must facilitate thinking that is adaptive, agile, flexible, and fluid. We must also identify the patterns in problem solving that help us avoid ‘recreating the wheel.’ The four underlying patterns of systems thinking, DSRP, provide universal atomic structures and elements that are foundational to an adaptive approach. DSRP structures and their elements are the modular, fractal, recursive, simple rules that lead to the emergent property of bespoke models for targeted problems.

When *The Fifth Discipline* was published 30 years ago, the now popular term *emotional intelligence* wasn’t a thing, nor was it a common household word, nor a desired skill of Fortune 1000 CEOs, nor was it a field of scientific research. When *The Fifth Discipline* was published 30 years ago, there was no ‘Future of Jobs Report.’ Today, the World Economic Forum publishes this influential report detailing the skills (personal mastery) people will need to succeed in our changing world. In 2020, the “Top 15 skills for 2025” [15] included:

³ Volatile, Uncertain, Complex, Ambiguous

1. Analytical thinking and innovation
2. Active learning and learning strategies
3. Complex problem-solving
4. Critical thinking and analysis
5. Creativity, originality and initiative
6. Leadership and social influence
7. Technology use, monitoring and control
8. Technology design and programming
9. Resilience, stress tolerance and flexibility
10. Reasoning, problem-solving and ideation
11. Emotional intelligence
12. Troubleshooting and user experience
13. Service orientation
14. Systems analysis and evaluation
15. Persuasion and negotiation

The recognition of these types of necessary skills belies the requirements of an increasingly VUCA world. People need a panoply of skills to thrive, and not merely analytical skills but emotional and prosocial skills [13,16–18], and a general disposition toward adaptive and fluid thinking. This adds another dimension to the idea of ‘personal mastery’ such that purposeful efforts to balance the analytical (IQ) and emotional (EQ) skills were now on the collective ‘radar’ of skills needed to navigate the increasingly complex world around us [17–23].

When *The Fifth Discipline* was published 30 years ago, systems thinking (ST) was a relatively new term and was made synonymous (mistakenly so) with system dynamics. At the time of publication of *The Fifth Discipline*, it was not clear that there were universal underlying structures (DSRP) to thinking and systems thinking, whereas today, we now know that these structures exist and are universal in mind and nature [10]. Systems thinking itself has changed dramatically in the ensuing 30 years. Indeed, the realization of DSRP now makes it clear that the underlying patterns of systems thinking (item #14 on the list above) are the cornerstones of *every one* of the items on the Top 15 Skills list. These skills cannot be developed and mastered without DSRP, as shown in the research showing that metacognition improves effectiveness in all domains [10,17,19,20].

All of these and more changes belie the importance of updating our understanding of what constitutes personal mastery and how to achieve it. This also changes the boundaries of who needs personal mastery in systems thinking and what types of systems are included.

Any person, Any System

When we talk about personal mastery, we’re talking about people. People who have interests. It shouldn’t matter who you are or what system is of interest to you for you to benefit from developing personal mastery in systems thinking. This is why we say that systems thinking isn’t

for certain types of people, it's for *any* person and systems thinking isn't for certain types of systems either, it's for *any* system. Systems thinking can be usefully and meaningfully applied *by any person* [13] from a first preschooler to a PhD, in the boardroom or in the classroom, from a rocket scientist to a citizen scientist, from a quantum mechanic to an auto mechanic, from pharmacist to farmer, and from quilter to skateboarder. Systems thinking can also be usefully and meaningfully applied *to any system*. Whether the system you are talking about is VUCA (volatile, uncertain, complex, and ambiguous) or drop dead simple. Whether the system you want to understand is: simple, complicated, complex, chaotic, or stochastic; large or small; local or global; important or fanciful; political, economic, social, technical, personal, private, public, etc.—systems thinking applies. Systems thinking can be equally applied to how we distinguish a coffee cup and to how we fight Covid-19.

Thus, personal mastery in systems thinking is something that—as of this writing—7,846,312,253 people must develop [13]. The advice we gave on how to approach systems thinking as a field in 2003 is dramatically different from what we would give today (2020). In an increasingly VUCA world it is important that problem solvers, systems thinkers, innovators, policy makers, business people, and the general public at large become capable of solving wicked problems. Only a minority of problems can be solved by off-the-shelf frameworks because the majority of problems we face require bespoke, customized models or 'built-for-the-task-at-hand-models.' *Thus, we cannot rely on one-size-fits-all frameworks when tackling today's problems.*

Personal Mastery (c. 2020)

While there are committed minorities who use any one of the MFS frameworks, many people attack problems with either no *articulated* model/process, a combination of models, or an *implicit* or *explicit* application of the cognitive skills of DSRP. In other words, when a formal model is not articulated, the four skills of distinction-making, systematizing, relating and taking perspectives naturally come into play, because DSRP is occurring in mind and nature whether or not we are conscious of it. This is metacognition—awareness of one's patterns of thinking (DSRP)—and it is the crux of personal mastery. It therefore becomes clear that three things are necessary for personal mastery: (1) the universal atomic structures of systems thinking (DSRP), which are discussed at length in this volume in Chapter 35; (2) the molecular structures of systems thinking (a.k.a, 'jigs'); and (3) the compound structures of systems thinking that include: (a) the diversity of frameworks in the 'MFS Universe'⁴; (b) especially, 'sliders' (modular, incremental, do-it-yourself developmental models that aid personal, emotional and prosocial attitudes, dispositions, and habits); and (c) the far more massive domain of models that we call 'knowledge.' All are essential in the development of 21st Century Personal Mastery and it is recommended that one proceeds in the order they were mentioned. Over the last 15 years, it has become increasingly clear—in theory, in practice (both our own and others'), and in research

⁴ See all Chapters in this Handbook for examples of most salient frameworks

[24–27]—that a base combination of DSRP and jigs is a best practice. See Appendix A for a step-wise list of how we suggest a person tackles such mastery on an incremental, daily basis.

The term, ‘use case’ refers to the way users (in this case, systems thinkers) go about using systems thinking. A particular use case does not imply that it is effective per se, only that it is one way in which people are using it. There are several possible use cases for example:⁵ (1) they use a specific framework, (2) they use a mix of frameworks, (3) they use DSRP, (4) they use DSRP + a framework, (5) they use DSRP + a mix of frameworks, or (6) they use none of the above. In this paper, we are suggesting certain use cases as being more effective in developing personal mastery than others.

We explained that the suggested ‘use case’ c. 2000 was ‘DSRP + MFS mixed-methods.’ The use-case we prescribe today (2020⁶) is ‘DSRP + jigs.’ In other words, rather than utilizing a single framework or mixed method approach (say, for example SWOT Analysis and/or soft systems methodology), successful practitioners [24–27] use deep first principles (DSRP) and jigs in their practice to address the problem at hand. The result is a model that is customized to the particular problem, bearing little to no resemblance to off-the-shelf frameworks. Today, when asked, how should I undertake a study of systems thinking as a field and a practice? The answer is: (1) gain a deep understanding of DSRP, and (2) begin to explore (one by one) the 44 known cognitive jigs [28].

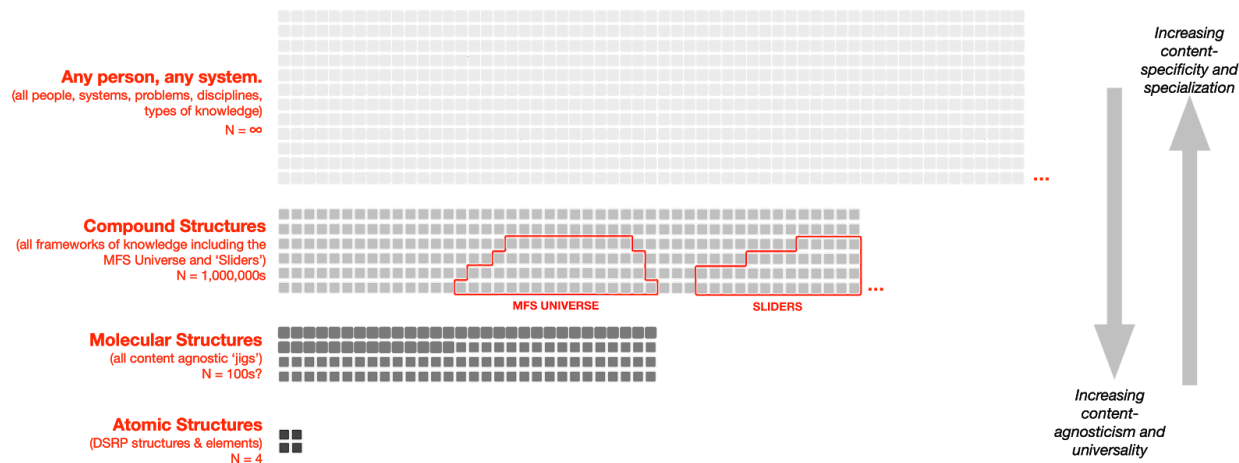


Figure 3: Personal mastery circa 2020: ‘DSRP + Jigs’ and the displacement of Frameworks (MFS).

⁵ Because DSRP is technically always being used, only consciously or unconsciously, the use of DSRP can take two flavors: (a) the *cognitive* use of DSRP in which the user is unaware of its use or (b) the *metacognitive* use of DSRP in which the user is aware and purposefully utilizing it.

⁶ In actuality we have been suggesting this use case for 8 years (so approximately 2012) but did so in order to see the results in limited case studies. When we say 2020 we are referring to the formal public suggestion that this is best practice.

While the MFS Universe exists, and while numerous specific concepts and learnings can be beneficially accrued from it, some large-scale frameworks seem over-engineered for any given problem, which leads to biases such as *shoehorning effects*. This is why a new approach, reliant on underlying structures such as DSRP and cognitive jigs offer a more viable approach to the types of problems faced in a VUCA world.

Jigs versus Frameworks: Displacement not Replacement

Jigs do not *replace* frameworks nor do they replace the MFS Universe. But they do *displace* them in terms of centrality and perhaps importance. That does not mean that frameworks are not useful and necessary—they absolutely are. Frameworks are especially good tools for very specific content areas, systems, or problems (i.e., if you have a population-based problem and your quantification of that population has construct validity, system dynamics is a fantastic tool). But frameworks are also, *by definition* due to their specificity, less flexible. *And*, in a world where problems are more VUCA, this lack of agility can be debilitating. Frameworks are useful, sometimes even optimal. But some of the time, they require a degree of *shoehorning*. For the field of systems thinking specifically, the frameworks in the MFS Universe are important. But, DSRP and jigs make the importance of frameworks tertiary, rather than primary. The primary 'go to' tool should be the atomic structures and elements of DSRP and the molecular structures of cognitive jigs. This is different from what we advised 20 years ago.

This shift in thinking has taken 20 years and has been debated for the last 8 years or so. It is not taken lightly. At the same time, there are countless situations where a framework was used because of the sunken costs of the time involved in learning the framework. System dynamics (SD) is a great example: It takes some time to learn SD. It takes even more time to get good at implementing it. So, naturally people prefer to use the tools they have when a problem arises. But SD, which is great at solving for *population* models, isn't always the right tool for other types of problems. This leads to examples of poor implementation when only one aspect of SD fits the problem (usually feedback loops). Thus, when asked, the problem solver will say they used SD, but on further analysis they only used the concept of a [qualitative] feedback loop (which is a jig!), which is only a small part of the SD approach. If we pay attention to the users' use-patterns as an indication of what was useful, we see that the relatively quick and flexible jig-like structure of a qualitative feedback loop was all they needed. This example shows us the power of jigs: they are more versatile because they are lighter weight, more agile and adaptive, easy to learn and easy to deploy.

This is a good example of how frameworks are *shoehorned* (i.e., 'every problem is a nail' or 'preloaded') and/or *overengineered* (i.e, bulky, cumbersome, over-specialized to a specific purpose but generalized in its claims of utility). SWOT (not typically thought of as a systems framework) is another great example of a framework that relies too much on specified content to be applicable. But it points out another thing. SWOT is actually easy to learn. In fact, its

ubiquitous popularity and use stems from how easy it is to learn. Many graduate students in business and policy learn SWOT and then see it as their go-to tool. Occasionally it's the right tool for the job, but sometimes it leads shoehorning—trying to make a square problem or system fit into a round framework. Unlike SD (which is much more general and abstract), SWOT is extremely content-specific. SWOT is a more general framework that is popular *because* it is simple, and unambiguously specific in its content (i.e., whatever you are looking at, there are Strengths, Weakness, Opportunities, and Costs). The issue is that, while these concepts can be generally applied as a lens to nearly any situation, to what end? Of what utility? SWOT is applied, over and over again, by generations of graduate students in policy and business, despite the fact that it is *just one, extremely limiting perspective* that frames every problem as a SWOT. SWOT points out problems in frameworks that are different than those highlighted by the system dynamics example. Where systems dynamics is overengineered, SWOT is lightweight, thus leading to its (over) adoption. Where systems dynamics, to be used properly, requires a significant time investment and steep learning curve, SWOT's high-perceived reward (really the comfort of having done *something*) to low time-investment ratio is what keeps it popular. While system dynamics, somewhat akin to a jig, is general in nature (within the scope of population models), SWOT is extremely specific. This specificity of content creates bias and makes SWOT the king of all shoehorned frameworks. It should be pointed out that SWOT is a derivative of the 2x2 table, which is a jig of ubiquitous utility.

These two examples —SD and SWOT— are good examples of why more emphasis on jigs is needed. Table 1 provides an overview of the dimensions of difference between frameworks and jigs. Obviously, there are frameworks that 'buck the trends' we mention below, but we offer that they are either the exception rather than the rule, *or they are actually jigs*.

Table 1. Dimensions of Difference Between Frameworks and Jigs

Dimension	Frameworks	Jigs
Modularity	Frameworks are not easily combined with one another (i.e., they often don't 'play well with others')...	Jigs are modular in that they can be combined almost like Legos to create new, more elaborate and detailed mental models.
Content	Frameworks are by definition content-dependent rendering them less adaptable or agile...	Jigs are content-agnostic and can therefore be used for any problem or situation.
Off-the-shelf vs Bespoke	Whereas frameworks promise off-the-shelf utility, they are often too content-dependent to be less flexible in how they can be implemented..	Jigs are, somewhat paradoxically, custom off-the-shelf tools. They are so basal that they fit the problem rather than fitting the problem to the model. They are wildly flexible.
Investment	Frameworks tend to have high resource, time, or learning costs...	Jigs are easy to learn, requiring fewer resources to use. They are 'bite sized' and can be learned in

		a few minutes. Developing skills with jigs provides the right tool for the job.
Conflict	Frameworks have a tendency to be all-or-nothing...	Jigs are additive. Learning a new jig doesn't require getting rid of an older one.
Shoehorning Bias	Frameworks can often bias the situation or the way the problem is framed (sometimes limiting the solution set)...	Jigs are small and modular so they can mix and match to create on-the-fly frameworks that fit the problem (i.e., model fits problem rather than problem fits model).
Epistemology	Frameworks tend to be epistemologically grounded or paradigmatically situated and/or cumbersome...	Jigs are not paradigmatic. They do not require paradigmatic, philosophical, or epistemological 'buy in' prior to their use. Jigs are ultimately pragmatic tools with little 'excess epistemic baggage.'
Bulk (weight)	Some frameworks are heavy, overengineered, and cumbersome....	Jigs are simple and easy to use.
Mind and Nature	Frameworks may or may not exist in nature because they are often conceptual heuristics...	The stripped-bare structure of jigs may often be parallelism in mind and nature.
Loading	Frameworks tend to be preloaded (people come to the problem with training in frameworks) in part because they require time and learning commitment...	Jigs tend to be post-loaded. They arise as valuable or useful if and only if the problem or situation warrants it.
Growth algorithm	There is an incentive for the number of frameworks to multiply and compete (causing solos and warring camps)...	Jigs are a relatively finite set for which membership is governed by a strict definition. Rather than being invented, Jigs are discovered. Many newly discovered Jigs have been in use for thousands of years without having been identified. While the number of known jigs (currently 44) may grow, unlike frameworks, the total is likely in the hundreds, not infinite.

A Path to Personal Mastery Today

For most folks we have worked with over the years in our roles as researchers, practitioners, and educators, they desire an explicit path that provides guidance on precisely what they should do and in what order. Obviously any step-wise order is suggestive at best. There are many ways to learn systems thinking and develop one's personal mastery. However, we have found in both research and experience, that starting at the base of the inverted triangle in Figure 4 is one of the best ways. See Appendix A for a step-wise list that follows the ideas in Figure 4.

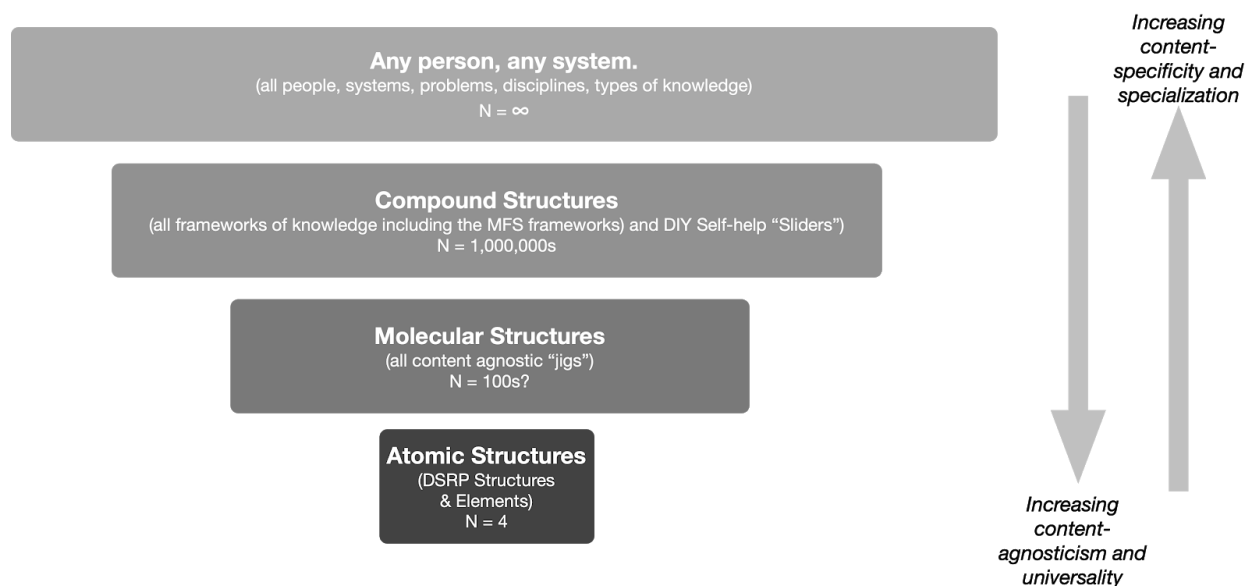


Figure 4: The inverted triangle path to personal mastery

Once you have started your journey, you will soon see that DSRP, jigs, and sliders, as well as many of the frameworks described in the Chapters of this Handbook will start to form a tool bench.⁷

When it comes to personal mastery, we use the word *path* in multiple ways. First, there is the *general* path set forward by Figure 4 (start with DSRP, then jigs, then sliders and frameworks, knowledge, etc.). That provides a theoretical basis for personal mastery. Second, there is the step-wise list in Appendix A which provides what so many people have told us they *desperately* need: a step-by-step list of recommended tasks for developing competence and confidence in systems thinking.

But there is a third meaning of the word *path* that is the most important of all: *burning a neural path*. Much of what systems thinking involves is going against the cognitive grain. What we mean by this is that while your brain is actually hardwired to do DSRP, it does so primarily in fast mode [29] which means it makes a lot of errors/biases. And, for most of human history, *fast mode* was reasonably accurate, because ‘coarse graining’ with all the precision of a chainsaw was ‘good enough’ and speed was beneficial. In a VUCA world, ‘fine graining’ with the precision of a knife or scalpel is often required when solving complex problems. Taking a bit more time to pause, avoid your immediate reaction, and think it through, is often rewarded. In

⁷ We recommend that you set your purpose to learn DSRP, jigs, sliders, and a handful of Frameworks over the course of 6 months where you contract yourself to regular practice. If you do, by the end of six months your learning will have transformed your thinking. Indeed, we recommend that prior to starting you write yourself a letter describing what you think systems thinking is, how you would like it to help you and the types of problems you want to be able to resolve. Seal this letter and address it to yourself in 6 months time. When you open it, you will have a contrasting experience of your thinking, then and now.

other words, practice ‘ready-aim-fire,’ instead of ‘fire-ready-aim.’ So, we are all fighting thousands of years of evolution to slow our thinking down a bit. On top of that, we are also fighting against dozens of years of social and educational training that has encouraged, incentivized, and rewarded certain pathways (mindless memorization of facts, extrinsically motivated behavior, linear thinking, etc.). Cabrera refers to this as ‘LAMO thinking’ [30]—Linear, Anthropocentric, Mechanistic, and Ordered. The net-net is: you are fighting against thousands of years of evolution and dozens of years of social and educational training to gain personal mastery in systems thinking. We liken it to going for a hike in the woods. Will you hike on the established trails or go off trail through the [sometimes] densely overgrown forest? Mastery in systems thinking requires that you go off the time-trodden trails of your mind (neural pathways). It requires you to forge a new trail—to burn *new neural pathways*. At first—like learning to play a musical instrument, a new language, or a new sport—it will feel awkward and just plain wrong. The only thing stopping you from a rewarding journey to personal mastery, however, is bushwacking those first few feet of new trail—rewiring your brain to think slightly differently by burning a new pathway. Once you do, the next time you go will be easier. And, like a trail, the more times you hike it, the more obvious the trail becomes. Soon, you’ll be taking those pathways without giving it much thought at all. It will be hardwired. One of the very best ways we have found for burning the neural path is what we call the ‘bathroom mirror contract.’ Put a dry erase marker in your toothbrush holder. When you want to incrementally build a new skill (say, practicing any of the D, S, R, or P skills or a new jig or slider) simply contract yourself by sketching it on your mirror. Give yourself a day, a week, whatever, to practice that skill and integrate it into your mind and behavior. Think of it like a miniature contract with yourself. In this way, personal mastery isn’t attained by one BIG push, but through tiny, incremental, modular ‘bites.’

DSRP: First Level Personal Mastery

Systems thinking is not a process but an outcome—it is an ends, not a means. Systems thinking is a complex adaptive system (CAS) and therefore systems thinking is an *emergent property* of a complex adaptive system. We must focus on the simple rules and agents that bring about systems thinking. There is a basic idea behind all complex systems—that simple rules and agents lead to collective behavior and emergence. If systems thinking is an emergent property, then those aspiring to be better systems thinkers must focus their efforts where they have influence: *executing the simple rules*. The discovery of these simple rules (which go by the acronym ‘DSRP’) is supported by empirical research findings [10,11,13]: *identity-other Distinctions Rule*: Any idea or thing can be distinguished from the other ideas or things it is with; *part-whole Systems Rule*: Any idea or thing can be split into parts or lumped into a whole; *action-reaction Relationships Rule*: Any idea or thing can relate to other things or ideas; and *point-view Perspectives Rule*: Any thing or idea can be the point or the view of a perspective.

Table 2: The universal structural simple rules of thought [13].

The Identity-Other Distinctions Rule	
$D := (i \leftrightarrow o)$	A Distinction (D) is defined as <i>identity</i> (i) co-implying an <i>other</i> (o)
The Part-Whole Systems Rule	
$S := (p \leftrightarrow w)$	A System (S) is defined as <i>part</i> (p) co-implying a <i>whole</i> (w)
The Action-Reaction Relationships Rule	
$R := (a \leftrightarrow r)$	A Relationship (R) is defined as <i>action</i> (a) co-implying a <i>reaction</i> (r)
The Point-View Perspectives Rule	
$P := (p \leftrightarrow v)$	A Perspective (P) is defined as <i>point</i> (p) co-implying a <i>view</i> (v)

Informational agents, using these simple interaction rules comprise the emergent property of systems thinking. Thus, in order for a person to systems think, or develop mastery in systems thinking, they must mix and match, combine and recombine these rules and the emergent property of that complex adaptive system is systems thinking. This is what makes it possible for DSRP to be so fluid and adaptive where other approaches will not be.

Among numerous other skills and abilities [10], the *Cognitive Flexibility* that characterizes all 15 numbered items in the World Economic Forum’s Future of Jobs Survey 2020, *requires* that systemic thinking be truly adaptive in order to result in the kind of agility needed to think about a bewilderingly diverse set of topics, issues, problems, and domains. Indeed, it might be said that systems thinking is uniquely capable of such adaptability and agility, flexibility and fluidity. Importantly, these four skills underlying systems thinking can be taught and learned. They can also be measured on a continuum, based on the degree to which an individual possesses each of the four things: making distinctions; organizing systems; recognizing relationships; and taking perspectives, using an edumetric test called the Systems Thinking & Metacognition Inventory (STMI) [21].

In the same way that atoms make up molecules, atomic structures (DSRP) make up molecular structures called ‘jigs’ which are important to personal mastery because they are often used as ‘templates’ of thinking—thinking structures that are time and user tested (sometimes over millennia). Metaphorically speaking, if *adaptive, fluid, sophisticated, systemic thinking* is the end goal of personal mastery, then DSRP is the concrete foundation and jigs are the floors and walls and roof.

Cognitive Jigs: Second Level Personal Mastery

Without knowing it, humans have used *cognitive jigs* for millennia (e.g., analogies, metaphors, similes [31], lists, tables, graphs, and others of equal utility). Jigs are *content-free molecular structures that can be combined and recombined (modularity) to create new bespoke models of understanding and problem solving*. Their unique structure, dynamism, and utility of cognitive jigs makes them an ideal tool for solving problems in an increasingly VUCA world. Jigs are molecular-level, content-agnostic structures that can be applied to any domain or problem because they are built on a foundation of the atomic structures and elements of DSRP. When compared to content-heavy frameworks, jigs are more accessible, applicable, and agile. The unique dynamism of cognitive jigs, borne of their modular, fractal, content-free, adaptive, structure, make them imminently useful in solving problems in such a way where the tool fits the problem rather than the problem being *shoehorned* to fit the tool. They are likely one of the most valuable and accessible cognitive structures available to humans. Of particular note is the fact that it is possible to discover new jigs as we navigate new situations, issues, or when we are building new ideas. We have provided herein an inventory of jigs (N=44) known to date, but it is likely that there are many more. The current inventory of jigs, provides a foundation for the future search and discovery, organization and development of new jigs as powerful systemic tools to help us meet the challenges ahead of us.

To better understand the potential and power of Jigs, ask yourself these questions:

1. How often do you use metaphors, analogies and similes?
2. When and where did you learn these ways of thinking?
3. What would it be like if you couldn't think in these ways?
4. How difficult would it be to explain things to people if you didn't have names for them (analogies, metaphors and similes)?
5. What if there were more equally useful structures that you could use?

First, all humans use metaphors, analogies and similes a lot. Some cognitive scientists [31,32] offer evidence of their universal usage, concluding that humans use them *constantly*. Second, note that these conceptual structures are taught in grade school or even earlier. For question #3, it would be difficult to imagine a world in which humans did not use such structures to understand things and navigate the environment. Question #4, tells us that we would use many of these structures even if they had no explicit names and we were not conscious of their use. However, being aware of their use and being able to reference them by name makes shared understanding of things much easier. Imagine if, like Shakespeare did [33], you mentioned to your friend that the “World is a Stage” and they wouldn't stop arguing with you that the world is, in fact, not a stage. Without the concept of a metaphor things would almost always be taken *literally*. Finally,

the answer to question #5 reinforces the importance of becoming aware of jigs, developing mastery of known jigs, and advocating for the discovery of new jigs.

What is a Jig?

What is a Jig? We extend the dictionary terms—that include physical jigs, a type of dance, a trick or game, and fishing and mining techniques, to offer a new type of jig—a cognitive jig. The following definitions provide insight into the difference between dictionary terms and what we mean by ‘cognitive jig.’

jig /jig/ n.

1 [*physical jigs*] A device that holds a piece of work and guides the tools operating it in order to provide repeatability, accuracy, and interchangeability in the manufacturing of products. A jig is often confused with a fixture; a fixture holds the work in a fixed location. A device that does both functions (holding the work and guiding a tool) is called a jig. Jigs or templates have been known long before the industrial age. There are many types of jigs, and each one is custom-tailored to do a specific job. Jigs are a form of template in that they can be a shaped piece of metal, wood, card, plastic, or other material used as a pattern for processes such as painting, cutting out, shaping, or drilling. Jigs therefore serve as a model for others to copy.

2 [*cognitive jigs*] A common conceptual structure or templatic mental model that can be used and reused for a particular cognitive purpose in order to provide repeatability, accuracy, and interchangeability in cognitive tasks. Cognitive Jigs are, to a large extent, content or information agnostic, meaning that any given jig could be used for a variety of cognitive tasks or across a variety of topical areas. Cognitive jigs allow us to not have to 'reinvent the wheel' when performing common cognitive tasks.

ORIGIN: The term jig is mid-16th century and of unknown origin; the term *cognitive jig* was coined by Derek Cabrera to communicate the practical and tactile use of cognitive jigs as a way to identify, use, and reuse cognitive patterns (mental models) that are common or repeatedly used. Cabrera gives various discovered jigs common, basic, and memorable names such as 'Barbells,' 'P-circles,' 'R-channels,' and 'Part-parties.' Analogies, similes, and metaphors are cognitive jigs. To date, 44 cognitive jigs have been formally identified, but Cabrera estimates there are hundreds more. Cabrera identifies the degree of content-agnosticism of a jig as an indicator of its universality. The more a jig is content agnostic, the more universal it is, and perhaps the more difficult it is to discover. [13,34]

Jigs are reusable structures of knowledge and thinking that increase cognitive efficiency. Think of a jig as a common conceptual template that can be used over and over again in your thinking. Where did the term 'jig' come from? A jig refers to “a device that holds a piece of work and guides the tools operating on it” [35]. Carpenters use jigs to do repeated operations that would otherwise (without the jig) take a lot of time and effort (see Figure 5), making jigs practical because they save cognitive time and effort.

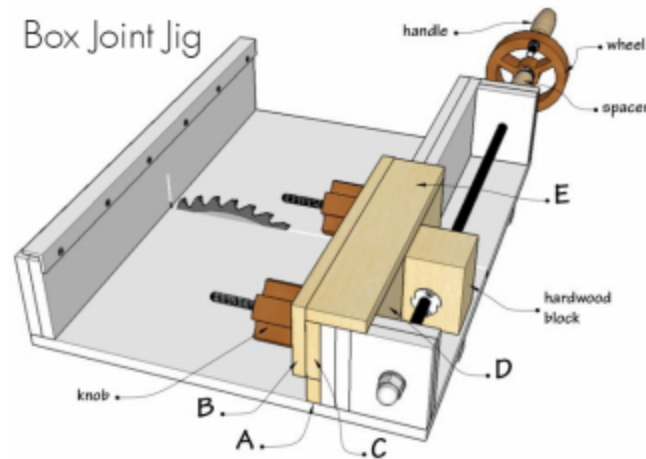


Figure 5: A Box joint jig used by carpenters to streamline the creation of complex joints.

You've Already Been Using Jigs for a Long Time.

While the term 'jigs' may be new to you, there are three common jigs you are already familiar with:

(1) Metaphor Jig: Figure 6 illustrates the underlying structure of a metaphor; when we say that A is something it is literally not, as in *A is B* or *All the world's a stage* [33]⁸.

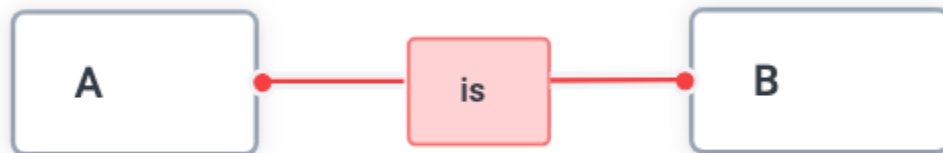


Figure 6: Metaphor Jig.

(2) Simile Jig: A simile states that A *is like* B, not literally the same as B as shown in Figure 7. For example, the difference between a metaphor and a simile is a small change to the information in the relationship from *is* to *is like*.

⁸ 'All the world's a stage' is a well-known line from Shakespeare's play, *As You Like It* which is believed to have been written in 1599; but appears to have been published for the first time in 1623.



Figure 7: Simile Jig.

(3) Analogy Jig: Like metaphors and similes, an analogy is not entirely content-agnostic because the primary relationship is content-specific and defined (*is like*), whereas everything else about the structure is variable and can take any content. Figure 8 illustrates this structure:

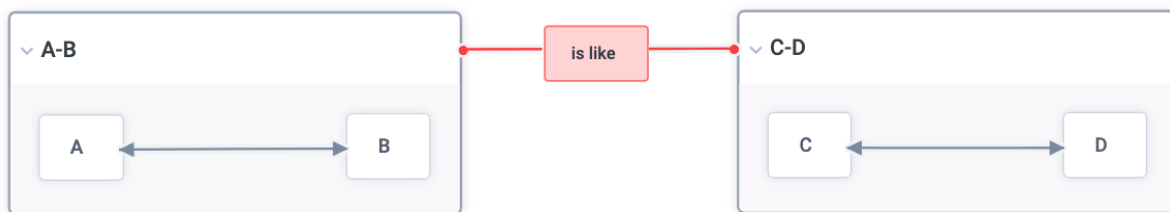


Figure 8: Analogy Jig.

Now that you have a sense of what a jig is, how they work, and how useful they can be, let's explore a jig that is less familiar but equally useful.

(4) P- circle: The 'Perspective Circle' jig is a simple common structure that looks at a *view* from multiple *points* creating a 'circle of perspectives' around any item, phenomena, situation, event, or system. Figure 9 illustrates this structure:



Figure 9: Perspective Circle Jig.

When one realizes how simple and sublime jigs can be, they see that these diminutive cognitive structures can pack a punch. It is easy to imagine a whole society of humans who know what an analogy is, because we live in a society where every grade schooler is taught the power of analogies and metaphors. Imagine, for example, a time where P-circles were every bit as familiar, part of our common language, and common usage. Imagine a time when you could say to nearly anyone on the street, “*you may want to P-circle that*” in the same way you could say, “*that’s gotta be a metaphor for something.*” There are dozens more jigs of equal simplicity and near-global utility, and there are presumably many more to be discovered.

Table of Known Jigs

Speaking of similes, universal jigs are *like* the *Elements* in the *Periodic Table of Elements* (in chemistry) in that the initial ones are relatively easy to identify but subsequent discoveries become increasingly more challenging. There are currently 44 known jigs identified in the *Table of Known Jigs*, but there are likely many more. Discovering a new universal jig is difficult because a jig is content-agnostic, and when a jig has relatively small amount of specified content (as in the case of metaphors, similes and analogies) that content is extremely general in nature (e.g., terms such as 'is,' 'like,' 'similar to,' etc). So Jigs have low levels of specified-content, but in the rare cases when the content is specified, it is extremely general as is seen in similes, etc.

Although time will tell, it is likely that the maximum number of jigs is an order of magnitude in the hundreds, perhaps thousands, but it is doubtful that it is tens of thousands. In other words, the order of magnitude is far less than the number of frameworks or knowledge itself (which is effectively infinite). In addition, it is quite possible that there is a form of *intra-disciplinary* jig—jigs that are used *within* disciplines. Hypothetically, discovering these jigs could enhance how we turn novices into experts in a particular discipline. If one includes intra-disciplinary jigs, the order of magnitude may be much higher but the ratio of information-content for these types of jigs will also likely be higher. It should also be noted that jigs are quantitative patterned structures. Note also that visual mapping techniques (such as Plectica and many others) are more advanced and have exponentially more users (like Facebook, Twitter, etc.). This means that discovering jigs—both in the general population and in a disciplinary population of mappers and maps—will become a relatively easy, automated, pattern-recognition task.

The Table of Known Jigs (Figure 10), organizes jigs according to the level of content specificity they possess (labelled as the Content Agnostic Ratio (CAR) number that is shown as ascending from right to left) and also by the degree to which D, S, R, or P are explicated in the jig (labelled as their 'atomic number' and shown as ascending from top to bottom).

(Content Agnostic Molecular Structures)



1. *Journal of Management Studies*, 1996, 33, 1, 1-14.

distinguish (D) the relationships (R) we make, such that 2 of the 4 structural patterns are explicated by the RD jig.

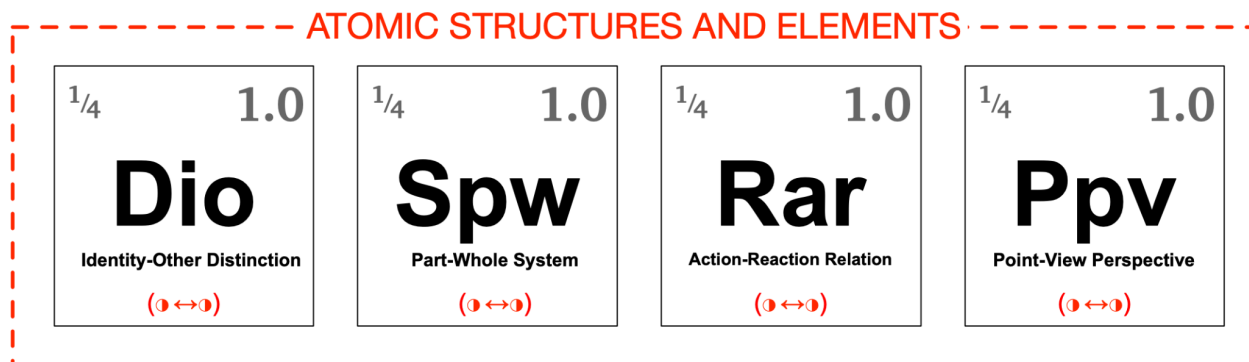


Figure 11: Atomic Structures and Elements.

Thus, known jigs can have atomic numbers of $\frac{2}{4}$, $\frac{3}{4}$, or $\frac{4}{4}$. All jigs have a short name and can be represented physically by both the DSRP Scripting Language (see below) and DSRP Mapping (demonstrated in Plectica Software).

Figure 12 provides the information needed to read the Table of Known Jigs and the summary detail for each individual jig.

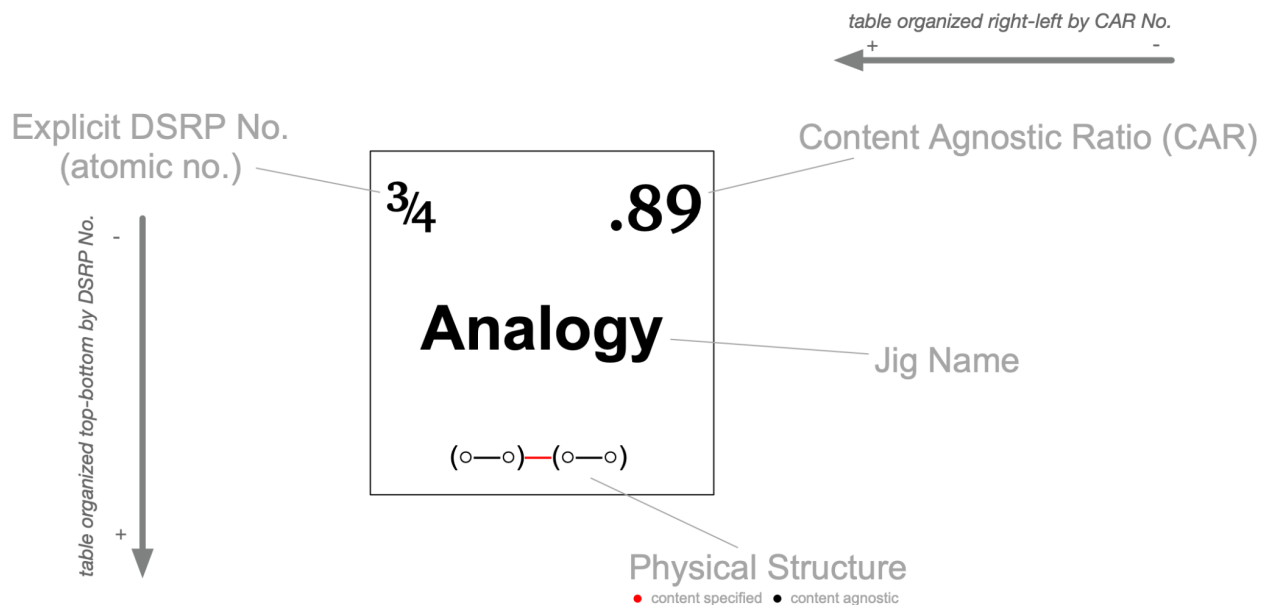


Figure 12: Key for Reading Table of Known Jigs.

DSRP Script

DSRP Script is a symbolic scripting language that has several advantages. Unlike DSRP Maps, which are nonlinear, DSRP Script allows the user to create a string of characters that mimics the

structure of DSRP Maps. This allows for inline communication, as in written documents, email, text or social media commentary. In addition, DSRP Script allows users to quickly detail the structure of a mental model (especially jigs) using only the symbols available on any keyboard. Certain symbols in the script are attained using strikethrough (command + shift + x) or underline (command + u). The \square , \circ , \forall , and \leadsto symbols are special characters. Table 3 lists the elements of the DSRP Scripting grammar. Each of the elements of DSRP Script can be combined to form various structural operations.

Table 3. Dimensions of Difference Between Frameworks and Jigs.

Symbol	Atomic Structure/Element
\square	Any structural symbol/set of symbols
\circ	Dio (identity-other Distinctions). Variants include: \bullet
\bullet	Only used for the Atomic Structures to indicate the dual-nature of the elements.
(\square)	Spw (part-whole Systems). Variants include: $()$
$—$	Rar (action-reaction Relations). Variants include: $\leftarrow \rightarrow \leftrightarrow$
$[\square]\square$	Ppv (point-view Perspectives). $[]$ is the <i>Ppoint</i> and $_$ is the <i>Pview</i> .
(\circ)	DS. A Distinction (Dio) that is also a System (Spw)
\ominus	RD. A Relation (Rar) that is also a Distinction (Dio)
\oplus	RS. A Relation (Rar) that is also a System (Spw)
$\oplus\ominus$	RDS. A Relation (Rar) that is also a Distinction (Dio) and a System (Spw)
$\oplus\ominus\oplus$	RDSP. A Relation (Rar) that is a Distinction (Dio), a System (Spw), and a Perspective (Ppv)
$*$	Multiplied across; carry-out across
\forall	All; includes all of whatever follows it
\dots	Repeat out to n; etcetera; more
\leadsto	Transform; what precedes it is transformed to what follows it
red	Content-specified
black	Content-agnostic

For example, the structural formula for an analogy jig is: $(\circ-\circ)-(\circ-\circ)$ which simply says that there are two related elements forming two systems ($(\circ-\circ)$ and $(\circ-\circ)$) that are themselves related by a content-specified relationship (in this case the $-$ signifies the content 'is similar to'). Figure 12 illustrates how to read an entry in the Table of Known Jigs and how the Atomic No., CAR No., and Structural Map is created for the Analogy Jig. For example, (1) the structural map can be read as follows: 'Two systems...each made up of two related parts...are themselves related by the specific relation 'is like'.' (2) In order to identify the CAR number, one merely counts the elements of the analogy jig's structure revealing that there are 9 structures, and only one of which is content-specified. So the CAR number is 8/9ths or 0.89. (3) Likewise, the Atomic Number can be ascertained by counting up the explicit (visible) instances of Ds, Ss, Rs, and Ps. We see in the Analogy Jig that there are visible Ds, Ss, and Ps, but no visible Ps. Thus, the Atomic Number of the Analogy Jig is $DSR/DSRP$ or 3/4.

Another example will perhaps further elaborate how the structural mapping works. A P-circle Jig identifies any number of Perspectives on any given situation, phenomenon, or system. The structural formula for P-Circle Jig is $s[\square][\square] \dots * \underline{\square}$. This structure elucidates that a P-Circle Jig involves two or more distinctions that are acting as points-of-view ($[\square][\square]$) and there could be as many more as desired to n (...). These points are *applied across* (*) any chosen structure ($\underline{\square}$). In this case the \square represents any of the DSRP structures containing any content whatsoever and the underlining ($\underline{\square}$) represents that whatever is underlined is the view from the point(s). Note that the structural formula for the P-Circle Jig, unlike that of the Analogy Jig, does not show any of the symbols in red. This means that the structure is entirely content-agnostic. It makes no difference what content one puts into the jig. In fact, the jig could accept entirely randomized content. This is one of the chief defining features of Jigs—that their Content Agnosticism Ratio (CAR) is quite high (especially given the general nature of any specified content) and therefore that the structure is universal.

Glossary of Known Jigs

There are currently 44 known jigs⁹ as shown in Table 4:

Table 4. Glossary of Known Jigs

Jig Name	Structure	Atomic No.	CAR No.	Description
Compare and Contrast	$\circ \leftrightarrow \circ$	2/4	0.50	A common jig that helps us to Distinguish how things are different and/or the same by using compare/contrast relationships. See

⁹ The process for identifying jigs is to determine its CAR and Atomic numbers. Currently Cabrera Research Lab (CRL) maintains the glossary and table of known jigs. If a new jig is thought to have been discovered, contact hub@cabreraresearch.org and CRL will: (1) confirm it, (2) award the Universal Jig Prize to its discoverer, (3) assign their name to the discovery of the jig, and (4) add it to the Table of Known Jigs and Glossary of Jigs.

				map . [36]
Dio Opportunity Cost	$(\circ(\circ \dots))(\bullet(\circ \dots))$	2/4	0.50	Dio means Distinction and its two elements identity and other. In this alternative case, you are thinking more about the ‘o’ that occurs when you decide the ‘i’. This jig identifies the ‘opportunity cost’ of making a distinction. See map . [37]
Feedback Loop	$\circ \leftrightarrow \circ$	2/4	0.50	A popular variation on Cycle Systems where 2 or more identities are relating in such a way as to alter each other in feedback. See map . [38]
Linear Feedback Process	$\circ \rightarrow \leftarrow \circ, \dots$	2/4	0.50	A jig that illustrates a linear process of related elements in which each successive element exhibits feedback to some or all previous elements. See map . [39]
Bracket	$(\circ \leftrightarrow \circ) \rightarrow \circ, \dots$	2/4	0.54	A Bracket Diagram used in many sporting events. See map . [40]
Cause-Effect	$\circ \rightarrow \circ$	2/4	0.67	An often used and familiar jig establishes a related cause and effect. Read more . [41]
Evolutionary Tree	$\circ \rightarrow \circ, \dots$	2/4	0.67	A linear tree with branches showing the relationships between predecessors and successors. See map . [42]
Fishbone	$\circ \rightarrow \circ, \dots$	2/4	0.67	Also called an Ishikawa Diagram or a cause and effect diagram, is a jig for distinguishing the potential causes of a problem in order to identify its root causes. Read more . [43]
Hierarchical Tree	$(\circ - (\circ, \dots), \dots)$	2/4	0.67	A hierarchical tree is quite similar to a bracket diagram but red top-bottom rather than left-right. Read more . [44]
Inference	$\circ \rightarrow \circ$	2/4	0.67	A conclusion reached on the basis of evidence and reasoning. See map . [45]
Metaphor	$\circ - \circ$	2/4	0.67	Note that a slight change in the fixed information can change the jig from a metaphor to a simile. Read more . [46]
Simile	$\circ - \circ$	2/4	0.67	Note how some of the information or structure of a jig can be either variable or fixed. Read more . [46]
Sequence-Flow Map	$\circ \rightarrow \circ, \dots$	2/4	0.67	A linear sequence of identities and relationships (like a number line). A variation on the sequence/flow jig involves variables that are plotted over time or in stepwise relation to each other but that can

				include multiple levels or scales and identities can have parts (S). Flow maps can be entirely linear, or contain feedback and the variables themselves can contain parts. See map. [47]
Dio List	$(\circ(\circ \dots))(\bullet(\circ \dots))$	2/4	1.00	Dio means Distinction and its two elements identity and other. You're making a list of the two elements. Very helpful in defining things at a basic level. See map. [48]
RD Barbell	$\circ \oplus \circ$	2/4	1.00	A barbell where the Relationship (R), is also a Distinction (D). (See Barbell Jig and RDS Barbell). Read more. [49]
Cycle	$\dots \text{---} \circ \text{---} \circ \text{---} \dots$	2/4	1.00	A set of 2 or more identities that are related in a circle (e.g., a feedback loop; a cycle, etc.). See map. [50]
Continuum	$(\circ \dots \circ)$	2/4	1.00	A continuum jig is used to plot a few options (usually 2, 3, 4) 'along a continuum.' It should be noted that there is always at least an implicit organizing perspective that creates the continuum (from X to Y, Less A, More B, etc). See map. [51]
List	$(\circ(\circ \dots))$	2/4	1.00	A list is a very well-known and popular jig that allows for a part-whole itemization. Read more. [52]
P-circle	$[\circ] [\circ] \dots * \square$	2/4	1.00	The 'Perspective Circle' Jig: A simple common structure that looks at a view from multiple points. Create a circle of perspectives around any item, situation, event, or system. Read more. [53]
nth-order P	$\dots [\circ][\circ] \square$	2/4	1.00	A common structure that helps us see our bias in looking at a perspective. Sometimes it is important to look at a perspective on a system from a second-order perspective or an nth-order perspective. See map. [54]
R-circle	$\circ \text{---} * \circ \circ \dots$	2/4	1.00	An R circle is just a bunch of variables relating in some way to a center variable. The Rs could be causal or not. Often used to map webs of causality in relation to some effect. See map. [55]
Table	$(\circ) \nabla * \leftrightarrow * \nabla (\circ)$	2/4	1.00	A part-whole jig consisting of a square grid of parts. Read more. [56]
Barbell	$\circ \text{---} \circ$	2/4	1.00	A simple common structure that helps us zoom into the relationship between two things. Named after a 'barbell' because of its structure. Read more. [49]

R'n R	$\text{---}^*(\text{---}, \text{---})$	2/4	1.00	R'n R Jig or Relate the Relations Jig makes relationships between a set of relationships. See map. [57]
P on Rs	$[\circ](\text{---} \text{---} \dots)$	2/4	1.00	P on Rs Jig takes a perspective on a set of Relations. See map. [58]
Analogy	$(\circ \text{---} \circ) \text{---} (\circ \text{---} \circ)$	3/4	0.89	Note how some of the information or structure of a jig can be either variable or fixed. Read more. [46]
Commonality by P	$\circ \bullet \sim \circ(\bullet) \sim (\circ(\circ \circ))$	3/4	0.89	a.k.a. Fruit jig because when a situation gives you apples and oranges (i.e., incompatibilities) sometimes you have to look for the common whole which is born of the common part(s). See map. [59]
RDS Barbell	$\circ \text{---} (\circ) \circ$	3/4	1.00	A barbell where the Relationship (R) is also a Distinction (D) and a System (S). Read more. [60]
Category	\circ	3/4	1.00	A popular and problematic jig because of its mass use usually involves leaving the perspective explicit, giving the false impression that things are fixed in their groupings. Read more. [61]
Jig Mix and Match	$(\square \leftrightarrow \square)$	3/4	1.00	A jig that allows you to mix and match other jigs to make new compound jigs. Very powerful. Read more. [62]
P to S	$[\circ] \square \sim [(\circ)] \square$	3/4	1.00	A jig to help avoid the bias of homogeneous perspectives of groups (or an individual). Rather than turning an S into a P like in S-to-P jig, you're turning a P into an S. See map. [63]
R-channel	$(\circ(\circ \dots)) (\leftrightarrow (\leftrightarrow \dots))$ $(\circ(\circ \dots))$	3/4	1.00	A simple structure that can be used to compare the relationships between two systems made up of parts. Any time you want to relate two systems, an R-channel is the jig for you. It's called an R-channel because the structure of the jig 'opens up a channel of space' in the middle to create many relationships across the systems. Read more. [64]
S of Rs	$(\text{---} \text{---} \dots)$	3/4	1.00	System of Relationships Jig (S of Rs): An important jig where a set of relationships (Rs) are seen as working as a system (S). Read more. [65]
S to P	$() \sim [()] \square$	3/4	1.00	S to P Jig (System to Perspective): A common structure jig where a system of related parts (a part party) is transformed into

				a perspective that can be used to look at a problem, situation or phenomenon differently. Could also be called S to P on an S Jig because this jig is a great way to solve a problem and use an understanding of the system you are analyzing to abstract an overarching lens to be used in future evolutions of the current problem system or future systems. Read more . [66]
XY Graph	$(\circ \dots \circ) \nabla \leftrightarrow \nabla (\circ \dots \circ)$	3/4	1.00	A Cartesian Graph. A well-known and often used jig that combines two Continuum Jigs with a system of parts plotted on each axis. (btw it takes two continuum jogs to make an XY Jig). Read more . [67]
Part Party (standard)	$\text{---} * \nabla (\circ, \circ)$	3/4	1.00	A Jig that helps us to relate the parts of a whole. Like a good party, the parts need to interact. A pervasive jig of all complex systems. Any good party involves interactions between the guests. Cognitive systems are no different--the parts must 'part-ay.' Read more . [68]
RD Part Party	$\text{---} \ominus * \nabla (\text{---})$	3/4	1.00	A Jig that helps us to distinguish and relate the parts of a whole. (See Standard Part Party Jig). Read more . [68]
RDS Part Party	$\text{---} \oplus * \nabla (\text{---})$	3/4	1.00	A Jig that helps us to distinguish and relate the parts of a whole. (See Standard Part Party Jig). Read more . [68]
Rar Cycle	$(\circ) \text{---} (\rightarrow \leftrightarrow \leftarrow) \text{---} (\circ)$	3/4	1.00	Rar Jig is a composite of things you can do with the most basic elements (action-reaction) of Relationships (R). It is a very powerful set of jigs that can be used to zoom into what is really going on when two or more things relate. Rar zooms into the dynamics of any Rs but especially psychotherapeutic or CBT (stimulus-response, etc). Read more . [69]
D to RD	$\circ \leadsto \square \ominus \square, \dots$	3/4	1.00	Take an identity and transform it into a Relation and then ask all the things it relates as a barbell between two Ss. See map . [70]
RDSP Barbell	$\circ \text{---} \oplus \text{---} \circ$	4/4	1.00	Add P to the R on an RDS Barbell. Read more . [60]
RDSP Part Party	$\text{---} \oplus * \nabla (\text{---})$	4/4	1.00	Add P to the R on all the RDS Barbells between parts in the S. Read more . [68]
DSRP Ecology	$(\circ () - []) * \square$	4/4	1.00	A jig, like the ecology jig that explicates DSRP structure relatively consistently across all elements. See map . [71]

Max DSRP Ecology	$(\circ () - [])^* \forall \square$	4/4	1.00	A jig where every element in the network is also a perspective ON the network. Read more. [72]
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In the same way that atoms make up molecules which make up more complex structures (i.e., matter—solids, liquids, and gases), atomic structures (DSRP) make up molecular structures (jigs) which make up compound structures (frameworks). The distinguishing factor, as illustrated in Table 4 above, is the ratio of information-content to structure. Such atomic structures (DSRP) have no information-content; whereas molecular structures (jigs) have relatively no information-content and are made of multiple atomic structures and; compound structures (frameworks) tend to be larger conceptual structures with a near 1-to-1 ratio of information-content to structure. Compound structures (frameworks) are always made up of a combination of atomic structures (DSRP) but also often contain one or several molecular structures (jigs).

Frameworks: Third Level Personal Mastery

Much has been written about frameworks of various kinds, from system dynamics to SWOT. Indeed, most of the Chapters herein deal with an individual framework. So we will not attempt in this limited space to review frameworks per se. But, we do want to reiterate what leads to something being a framework. *Frameworks are compound structures with relatively high content-specificity.* In other words, if removing the content (and keeping the structure) of a mental model makes it effectively meaningless (or no longer that mental model), then it is a framework. With this relatively new formulation, we can see that the number of things that could be classified as frameworks grows exponentially. Most, if not all, of what was included in the MFS Universe is included. Likewise, all the frameworks from other fields and disciplines such as SWOT are included. Indeed, most of what we call human knowledge across the disciplines is included. Figure 13, shows three frameworks from different fields. One, soft systems methodology is considered part of the traditional ‘systems thinking’ field and is included in the MFS Universe. The other two, are not. SWOT is a well known framework in the management and policy arenas. Third, the [Linnaean] species concept is the most popular framework for how life on the planet is organized. All of these frameworks are mental models because they are a combination of content-information and structure. And, these in particular, are frameworks characterized by relatively high content-specificity. For example, if we removed all the terminology (words) from the soft systems methodology framework, it would be little more than a bunch of meaningless shapes. Likewise, if we removed all the terminology (words) from the SWOT or species concept frameworks, the remaining shapes and colors would not communicate the same ideas that they would with the inclusion of the content.



Figure 13: Different compound structures (frameworks) of general and specialized use.

In those respects, they are the same. They are not universal or atomic structures. They are also too content-specific to be considered jigs (molecular structures). Rather, they are *compound structures with high content-specificity that* are different in their *utility* (use). Soft systems methodology and SWOT are similar in that they can be applied generally (within some sphere of relevance) such that you can imagine a soft systems methodology map or SWOT analysis from an infinite number of situations. Soft systems methodology could be applied to nearly any situation. SWOT analysis could be applied to nearly any situation or organization. The [Linnaean] species concept is somewhat different. It is a framework of knowledge that has a very specific use that does not have generalized use like soft systems methodology or SWOT.

As we discussed earlier, the development of personal mastery in systems thinking applies to *any person, any system*. We must therefore account for *any knowledge*¹⁰ that might be relevant to solving a problem or understanding a system in any domain expanding the boundary of applicability beyond the MFS Universe.

This new boundary includes ‘sliders’ to account for the fact that human cognition includes not only the *cognitive* domain but also the *emotive* and *conative* (motivational). Human cognition, whether it occurs at home or at work, is the *personal* part of mastery. ‘Sliders’ are mental models that are structurally and informationally specific that can be used within a *domain* (generally or specifically). A slider is a framework that is applied to a specific *domain: the development of personal qualities, habits, and dispositions*, making it different from other frameworks. There are other qualities of sliders, that make them similar to a jig in their *modularity, diminutive size*, and

¹⁰ A few definitional clarifications should be noted. First, *mental models* are synonymous with knowledge, shema, and meaning. *Information* is synonymous with data, content, etc. *Thinking* is synonymous with the structuring, organizing, or encoding, information. Second, a *mental model* is made up of *information* and *thinking* (structure). It should be noted that universal atomic structures (DSRP) are structures that exist [empirically] in mind and nature, so could be considered *knowledge* (a mental model) in one case (when they occur in mind) but are not technically *knowledge* in another case (when they occur in nature). Third, *all* molecular structures (jigs) and compound structures (frameworks) are mental models (*knowledge*).

ease of take-up. In addition, it is hypothesized that there are a relatively *finite* number of jigs, whereas there could be as many sliders as there are situations in which they are needed.

Sliders are therefore a necessary part of *personal* mastery as it would be impossible to remove emotional intelligence from the very definition of the term. A wealth of research shows that when individuals are made aware of the way they think, it improves “achievement in all domains” [17], including self-awareness and personal health. Developing metacognition through DSRP, jigs and sliders strengthens one’s ability to transfer skills across fields [22] and develops emotional intelligence [16,73] along with creativity [74]. Thus, sliders are the last piece of developing personal mastery in systems thinking, accounting for the balance between IQ and EQ as essential components of such [13,18].

Sliders: The Diminutive Powerhouse of Personal Development
Cabrera [23,75] defines sliders as:

slider

noun slider /'slīdər/ n.

1 a small hamburger or other hot sandwich made with a soft bun.[35]

2 [cognitive slider] A cognitive slider is a small mental model, the use of which is expressly in the domain of personal development or psychological-sociological effectiveness. Sliders are often used to develop personal mastery in a DIY therapy approach. [34]

The term slider originally referred to a miniature hamburger. The term was coined in the 1940’s by sailors who referred to the miniature burgers as 'sliders' because they were very greasy. The first production slider was offered by White Castle as a 'five cent burger.' Today, sliders have taken a decidedly high brau trajectory, with famous chefs like Gordon Ramsay, Wolfgang Puck, Rachel Ray, and Bobby Flay offering sliders on their menu. These sliders range from a standard cheeseburger fair to the portobello and brie slider or even a Kobe beef and European White Truffle slider. Sliders need not be hamburger (beef) either, as they now range across all meats (salmon, goat, ostrich, etc) and even include quinoa and other vegetarian options. In other words, sliders have a simple basic structure (small bun, small patty, accoutrements) but a nearly infinite diversity.

For this structural universality but manifestable diversity and their diminutive size but nourishing attributes, as well as the ability to mix and match various types of sliders on the same plate, the term slider was chosen to communicate “a relatively small, nourishing or ‘meaty’ mental model” for use in increasing one’s prosocial or emotional intelligence [76]. Like jigs [77,78], sliders are applicable to a wide array of situations or circumstances, but somewhat different than jigs, sliders tend to assume far more content (less content-agnosticism). They are more specific in their application to the social, psychological realms and particularly useful for what Cabrera calls

'DIY therapy'—a modern form of do-it-yourself personal development or psychotherapy loosely based on the principles of cognitive-behavioral therapy and situated in: the growing distrust of the objectivity and commercialization of the psychological profession, the growing need for heightened prosocial and emotional intelligence, and the modern DIY movements. Like jigs, various *built sliders* (sliders that are built by others) are given common, basic, and memorable names such as 'Thinkings & Feelings,' 'Analog yourself,' 'Good new bad news who knows,' 'Dysfunction Magnet,' and 'the modified Golden Rule.' Importantly, sliders are also something that anyone can invent for others or for themselves. Sliders can be designed for a very particular purpose that is personal and situated. Any personal problem or goal can be rudimentarily designed into a slider and practiced until it becomes a habit. *The purpose of a slider is to maintain one's developmental focus on the mental model to be integrated into oneself, for the period of time it takes for something to become habitual.*

Notably, sliders are based on DSRP Structure but have personal mastery or personal development type content. They are decidedly not content-agnostic, but are generalizable in nature. For example, a slider like Thinking v. Feelings is generalizable, but only insofar as it is in the domain of human thoughts and emotion (in other words, unlike a jig, it perhaps is not generalizable to every discipline or topic or situation). Sliders also offer an evolutionary and incremental approach to personal psychology. In other words, sliders take a modular, mix and match, 'Lego-like' approach to mental models and personal psychology. Such that small malady can be fixed behaviorally and then another and another. Sliders can be described verbally or in writing but they are most often manifested in a structural systems map.

Examples of Sliders

The best way to understand sliders is to explore some examples of them. Numerous examples exist, and an effort to inventory sliders has begun [75]. We provide three example sliders below:

Distinguishing Thinking and Feelings:

Conflating feelings and thoughts is something that makes it so that one is not able to deal with their feelings, or their thoughts. By combining the two, both become unusable. Thoughts are fundamentally variable. They can be debated, played with, molded, right, wrong, and in-between. The structure of expressing a thought is: 'I think X ...' (where $X = \infty$). The most important aspect of a feeling that distinguishes them from a thought is that a feeling just is. Feelings are never wrong. They just exist. They are yours. What is truly essential to a feeling is expression. This can be done simply by saying 'I feel Y' (where $Y \approx 12$ or so, basic human emotions) [79].

Thoughts (mental models) often bring about feelings. And, when thoughts and feelings are conflated, the original thought that brought about the feeling can become entangled with emotion. In turn, this conflation with emotion can cause a person to be more invested in the thought being 'right.' This is why it is so important to distinguish between feelings and the

thinking to determine the causality: did the feeling lead to the thought or did the thought lead to the feeling? The distinction between feelings and thinking, while seemingly innocuous, is essential for metacognition, systems thinking, and one's personal mastery. It is essential for what Cabrera calls [23], do-it-yourself (DIY) self-help and DIY-CBM (Cognitive-Behavioral Mastery). Becoming aware of how often others merge the two in normal conversation can be fascinating to observe. By being conscious and actively working to keep feelings and thoughts distinct, one can have a better relationship with their emotions, and improve communication overall.

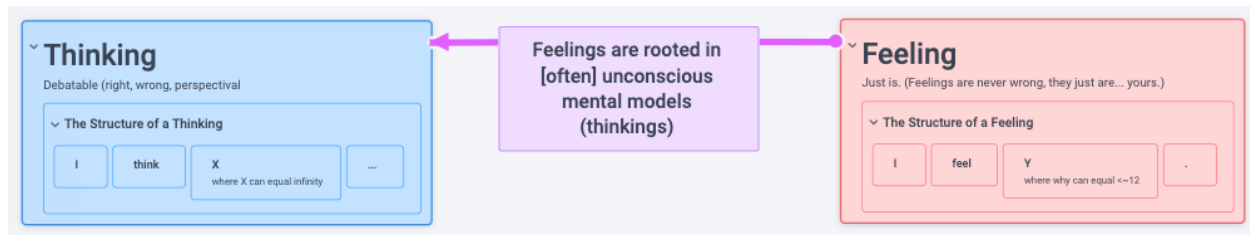


Figure 14: Feelings versus Thinking Map.

Relationships Sponsored By The Number 3:

Most people think of relationships as being made up of two people (one person plus one person would equal 2). It turns out that relationships that are sponsored by the number 2 can end up being quite dysfunctional, whereas relationships that are sponsored by the number 3 can be more functional [80]. A relationship sponsored by the number 2, is made up of one person and another person. When relationships are going well, they are going well. But when they have conflict, the question is: where does that conflict exist? Where does the cause or the blame of that conflict land? Where do the good traits of a relationship reside and where do the bad traits reside? The problem is, if your relationship is sponsored by the number 2, then those things can *only* reside in *you* or in *me*.

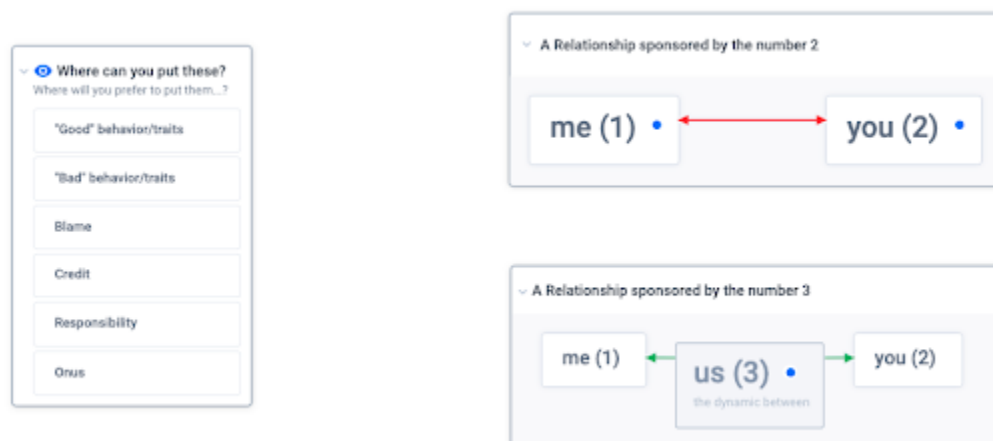


Figure 15: Relationships Sponsored By The Number 3 Map.

However, if you have a relationship that's sponsored by the number **3**, then there are three places where you can put the onus: you, me and *us (the relationship)*. You have the dynamic relationship between two people included in the equation. That's the third variable. So rather than two variables—you and me—we have three variables— you, me and us—which encompasses the relationship. In that relationship, all of the credit, blame, onus, responsibility, etcetera can be placed in the 'us.'

Mental Models Cause Behavior:

Mental models are happening all the time. There are pervasive mental models that are both the conscious and unconscious things that you think. When we say that mental models drive behavior, we're not saying that it's always 'purposeful,' but that there is a mental model that precedes that behavior. Mental models directly cause behaviors [76].

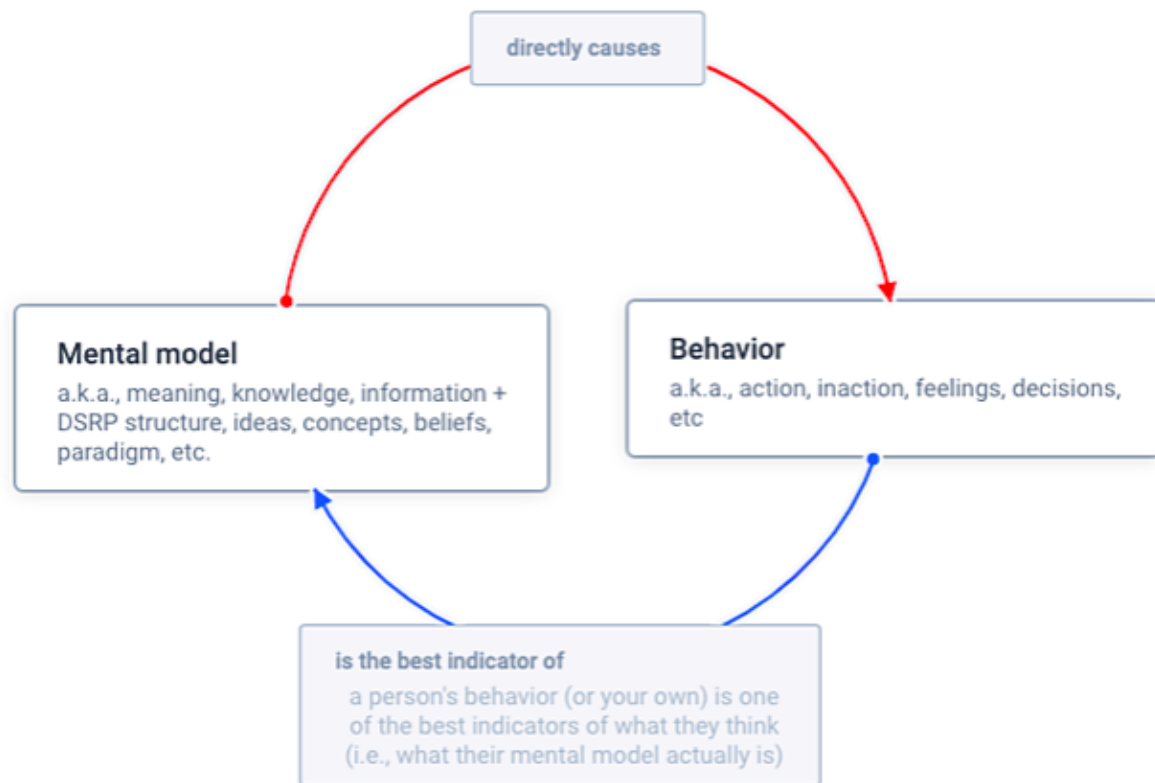


Figure 16: Mental Models Cause Behavior Map.

This slider can be particularly helpful with negative reactions one has to certain stimuli. For example, if you were told right before you walked into a room of 20 people that all of those people think that you're an idiot, that they hate you, and they're going to attack you, what might be some of the behaviors you're going to see based on that mental model? You'd be nervous,

anxious, insecure, defensive... all those are predictable behaviors. But, if you walk into any room and you feel nervous, apprehensive, anxious, it might be because someone, namely you, is telling yourself those types of things *before* you walk into that room.

Being aware, or metacognitive, about the connection between what we think (mental models) and what we do (behavior) allows one to know themselves. This slider can be approached from both sides of the fence. In other words, if you understand what the mental model is, then you can predict what the related behavior is going to be. Conversely, if you understand what the behavior is or has been, then you can backward design to determine what the mental model behind that behavior must be. One could hypothesize what that mental model that led to a certain behavior probably looks like. Therefore, a behavior is a good indicator of a mental model and a mental model plays itself out in real life as a behavior.

Conclusion

Atomic structures (DSRP), molecular structures (jigs), and compound structures (frameworks and sliders) are the building blocks for developing personal mastery in systems thinking. They provide any person the ability to develop lifelong skills and a fluid, adaptive disposition. They allow *any person* to get purchase in understanding *any system* or solving any problem. Yet, if systems thinking is to maximize its potential, it cannot be something only experts, scientists, and professional problem solvers use. It must be something everyone can use. A clear *path* to personal development is therefore needed. Not only can this path be utilized by institutions tasked with developing the next generation of thinkers—it can also benefit individuals, who take it upon themselves to develop and practice their own mastery *incrementally*: one universal structure, one jig, one slider, one framework...one new bit of knowledge at a time.

APPENDIX 1: Recommended Steps to Developing Personal Mastery

We suggest people start with the atomic structures (DSRP) which precedes learning the molecular structures (jigs) and sliders, which lead us to the domain of emotional and prosocial intelligence, key parts of personal mastery.

The following list provides several steps foundational to mastery in systems thinking:

1. Commit to burning the neuronal pathways. Start by committing to daily, incremental work. Ideas include:
 - a. Sign up for a list like Systems Thinking Daily on Facebook [81];
 - b. Commit to practicing DSRP, for brief moments throughout the day; and
 - c. Before you tackle big looming problems in life or work, just play with DSRP in silly and minute-to-minute scenarios.

2. Familiarize yourself with the concepts (available through various mediums):
 - a. Watch, “A Little Film about a Big Idea [82].”
 - b. Explore a new form of inquiry, Thinkquiry [83].
 - c. Watch, “Re: Thinking [84]” (one hour documentary on systems thinking).
 - d. Read “Systems Thinking in 7 Images” for a big picture overview [85].
 - e. Watch, “Systems Thinking for Newcomers [86]” (a free online lecture on DSRP).
 - f. Read the book, *Systems Thinking Made Simple* [13].
 - g. Take the short LinkedIn course, “Systems Thinking [87].”
3. Deepen your understanding of systems thinking:
 - a. Get certified in systems thinking, systems mapping and systems leadership [88–91];
 - b. Start learning systems mapping skills [92];
 - c. Start using ThinkBlocks to model systems;
 - d. Begin applying to more difficult problems in life, work, or society;
 - e. Continue daily practice of elements of DSRP;
 - f. Start incorporating jigs (commit to learning and using 1 jig per week);
 - g. Start learning new sliders (commit to learning and using 1 slider per week);
 - h. Continue your learning of jigs (commit to learning and using 1 jig per week);
 - i. Continue learning new sliders (commit to learning and using 1 slider per week); and
 - j. Continue learning new frameworks/knowledge (commit to learning and using 1 new systems thing per week).

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