

CHESS ARCHITECTURE



*“Education in chess has to be an education
in independent thinking and judgement.”*

Emanuel Lasker

Version 2

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Keith McCaughin

Cover Photo: Grand Master Vugar Gashimov

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INTRODUCTION

Version 2 of the Chess Architecture is based on peer review at chesspublishing.com. I thank peers for the insightful comments and recommendations. I will make it clear that the paper is not meant to teach chess. I am presenting an architecture that can help chess players from beginners to club players learn to think while playing chess. With my goal clarified, I will severely limit the amount of detail about chess knowledge. I will focus on the levels of the architecture and the recommended process for learning and planning. This paper is intended for chess teachers, coaches and players advanced enough to understand and learn that the:

1. Play, tactics, strategy, and goal levels of chess each require different modes of thinking.
2. Process of making a good move ascends and descends through all levels of thinking.
3. Planning is the most important objective during the process of thinking.

The Chess Architecture is a four-level hierarchy of focused and diffused modes of thinking exercised in a seven-step process based on the psychology of action developed by Donald Norman. The objective of the Chess Architecture is to help create a habit in a chess player of thinking and planning rigorously and at peak level on every move of every chess game through continuous conscious use in practice. I will introduce you to four architectures that will be integrated to form the Chess Architecture:

1. Architecture of Learning
2. Architecture of Understanding
3. Architecture of Planning
4. Zachman Architecture Framework

Architecture of Learning

Learning occurs along the arrow of time only when we go back and forth between focused and diffused modes of thinking. The diffused mode(s) without the focused mode(s) is limited because we do not have a firm foundation on which to build knowledge. The focused mode(s) without diffused mode(s) severely limits progress as it does not allow creative thinking, connecting similar concepts or extending neural pathways¹.

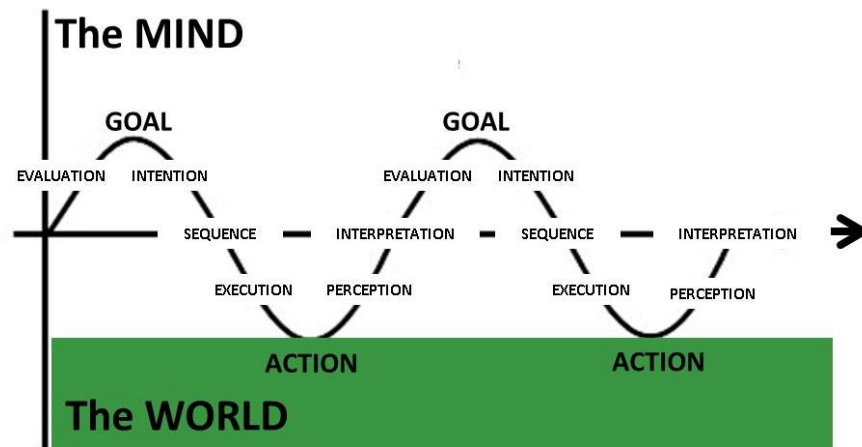


Figure 1 learning as a sine curve through time

The sine curve of learning:

- Thinking and acting occur continuously along the sine curve
- Focused learning increases approaching the low point of the curve
- Diffuse learning increases approaching the high point of the curve
- Acting and evaluating as a pair generate knowledge in each full cycle along the curve²
- Knowledge is the current cumulative state in memory at any point along the curve

¹ Oakley, Barbara, A Mind for Numbers, the companion book to COURSERA®'s wildly popular massive open online course "Learning How to Learn"

² Norman, Don, The Design of Ordinary Things

Architecture of Understanding

Once we have learned, we have some degree of understanding as defined by Dr. Russell Ackoff. The defined levels of understanding correspond to the levels of learning and make it perfectly clear how each level of the learning architecture is distinctly different from the next and that each higher level builds on the lower levels. Here are the levels of understanding that correspond to the levels shown on the sine curve of learning: data, information, knowledge, and wisdom.

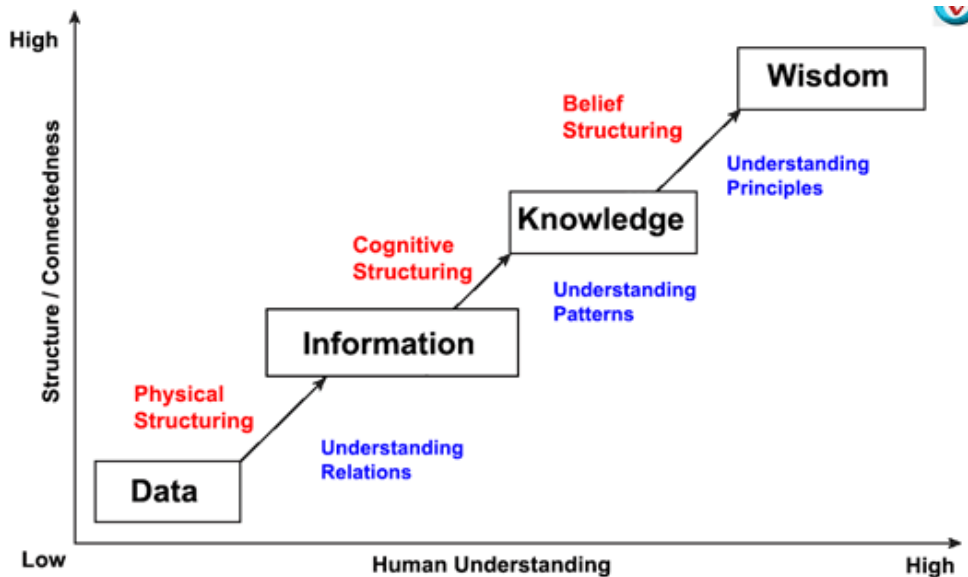


Figure 2 Dr. Russell Ackoff's levels of understanding

1. Data are perceived facts – understanding the relations of the chess board and pieces
2. Information is interpreted data – understanding patterns and cognitive structuring
3. Knowledge is evaluated information – understanding principles and belief structuring
4. Wisdom is assimilated knowledge – understanding what condition(s) require action

Architecture of Planning

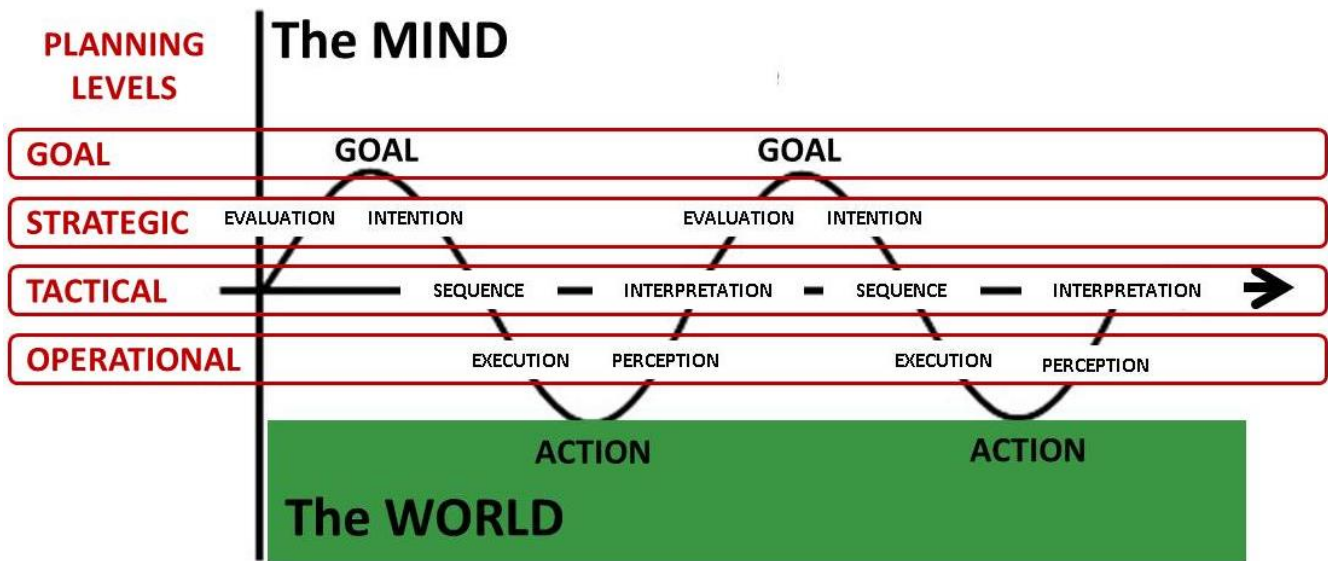


Figure 3 planning levels overlaid on the sine curve of learning

Planning follows an architecture that corresponds to and guides the learning architecture. It consists of four levels that correspond directly to the seven stages of action shown on the sine curve above. The planning architecture was chosen because it is commonly understood within the chess community and it should be transparent to chess players.

This sequence of stages of action through all four levels of planning and back again is the Chess Architecture. The nature of the planning levels is described in each step at the seven stages. The plans at each level of planning guide and constrain each lower level of planning. The stages take action on the way down and confirm or measure deviations from respective plans on the way up. The level of planning and related stage of action becomes more concrete and specific on the way down and more general and abstract on the way up. Each stage of action at each level of planning applies that level's degree of concreteness and specificity or generality and abstraction.

Zachman Architecture Framework

It is not mysterious why the people who build buildings, airplanes, battleships, locomotives, computers and all the industrial age products that are sufficiently complex to warrant architectural descriptions came up with a set of descriptive representations. They answer the six primitive interrogatives that constitute the total set of questions that have to be answered to have a complete description of anything: what, how, where, who, when and why.

- What is it made of?
- How does it work?
- Where are the components relative to one another?
- Who is responsible for what?
- When do things happen?
- Why do they happen?

This goes back about 7,000 years to the origins of language. It has been well-exercised by humanity for thousands of years. If you don't answer all six primitive interrogatives it means that your description is incomplete.³

The Zachman Framework	DATA What	FUNCTION How	NETWORK Where	PEOPLE Who	TIME When	MOTIVATION Why
SCOPE (Conceptual) Planner	Things Important to the Business	Processes the Business Performs	Locations in which the Business Operates	Organizations Important to the Business	Events/Cycles Significant to the Business	Business Goals/Strategies
BUSINESS MODEL (Conceptual) Owner	Conceptual Data Model	Business Process Model	Business Logistics	Work Flow Model	Master Schedule	Business Plan
SYSTEM MODEL (Logical) Designer	Logical Data Model	Application Architecture	Distributed System Architecture	Human Interface Architecture	Processing Structure	Business Rule Model
TECHNOLOGY MODEL (Physical) Builder	Physical Data Model	System Design	Technology Architecture	Presentation Architecture	Control Structure	Rule Design
DETAILED REPRESENTATIONS Sub-Constructor	Data Definition	Program	Network Architecture	Security Architecture	Timing Definition	Rule Specification
FUNCTIONING ENTERPRISE	Data	Function	Network	Organization Units	Schedule	Strategy

Figure 4 Zachman Framework

Who, when, and where are the players, at a certain time, and place and all are outside chess play. They are the purview of the tournament director. We are interested in those that help understand chess play and the Chess Architecture:

- Why we play?
- What we will do?
- How we will do it?

³ <https://www.zachman.com/resources/zblog/item/enterprise-architecture-defined-architecture-abstractions>

CHES ARCHITECTURE

The Chess Architecture integrates all the architectures I have presented so far. I present and explain a four-level learning, understanding, planning and English language architecture with an embedded seven-stage cycle to train chess players' minds. I believe conscious repetition of the stages within the levels of the architecture shown in Figure 5 below will lead to playing chess at a consistently high level.

The architecture is four levels of:

1. Learning: diffuse, diffusing, less focused, most focused
2. Understanding: wisdom, knowledge, information and data
3. Planning: goal, strategic, tactical, operational
4. English Language: why, what, how, and act

And seven stages of action:

1. Perception: perceiving the state of the world, the chess board and environment
2. Interpretation: interpreting the perception
3. Evaluation: evaluation of interpretations
4. Goal: assess opponent's move and make your best move
5. Intention: intention to act
6. Sequence: sequence of actions
7. Execution: act



Figure 5 Chess Architecture integrates learning, understanding and planning models

Planning Versus Reacting

Benjamin Franklin said “Those who fail to plan, plan to fail”. This is certainly true in chess. Planning at each of the four levels; Goal (planning to plan), strategic, tactical, and operational is necessary for chess players to make progress. Stages of action are directly related the four levels of planning.

- Goal level is planning to plan and guides and constrains strategic planning
- Strategic level plans the intention to act and guides and constrains tactical planning
- Tactical level plans the sequence of actions and guides and constrains operational planning
- Operational level plans the execution of the sequence of actions

Planned actions do not react to an opponent’s move until all seven stages of action have been thought through completely starting with a change in the position on the chess board.

- Operational level perceives, records and transmits position data to the tactical level
- Tactical level interprets the data and transmits information to the strategic level
- Strategic level evaluates the information and transmits knowledge to the goal level

This sequence of stages of action through all four levels of the Chess Architecture illustrates planning to act versus reacting. The nature of the levels is described in each step through the seven stages. The plans of the levels guide and constrain each lower level. The stages act on the way down and confirm or measure deviations from respective plans on the way up. The levels and related stage become more concrete and specific on the way down and more general and abstract on the way up. Each stage at each level applies that level’s degree of concreteness and specificity or generality and abstraction.

The mind is capable of thinking about all previous positions on the chess board at any time using the brain’s memory. So if the position on the board does not change significantly or you anticipate moves ahead of them actually occurring, you do not need to go through all seven steps of action, you can act immediately or at any level based on prior knowledge or anticipated actions. But to create a good habit it is best to go through the entire cycle on each move.

The process starts at point 1 at the operational level in Figure 5 above and proceeds through all the 7 points and levels and the changed position on the chess board in a repeating sequence throughout a chess game. The eighth point, the position on the board, is not a process step therefore it is not numbered.

Until this Chess Architecture becomes habit so it can be executed from memory, think through each stage at every level in order on every move! Chess is an exercise of the mind so you want to exercise the mind in as consistent, efficient and effective a way to think during every move of every chess game. Training the mind to think at all levels and steps in chess is the analog of practicing scales and exercises on a musical instrument or calisthenics and exercises in athletic activity.

Thinking and planning take discipline and they are much more important than IQ. Edison, who registered more patents than anyone, else worked from the goal down and said that it took 98% perspiration and only 2 % inspiration! Westinghouse who was not far behind him in registered patents and worked from the perception of conditions in the world would have agreed.



Figure 6 Grand Master Vugar Gashimov planning

Famous planning quotes to remember:

- **“It is not a move, even the best move that you must seek, but a realizable plan.”** Eugene Znosko-Borovsky
- **“Even a poor plan is better than no plan at all.”** Mikhail Chigorin
- **“A bad plan is better than none at all.”** Frank Marshall
- **“The plan is nothing, planning is everything.”** Dwight David Eisenhower

Extreme Example

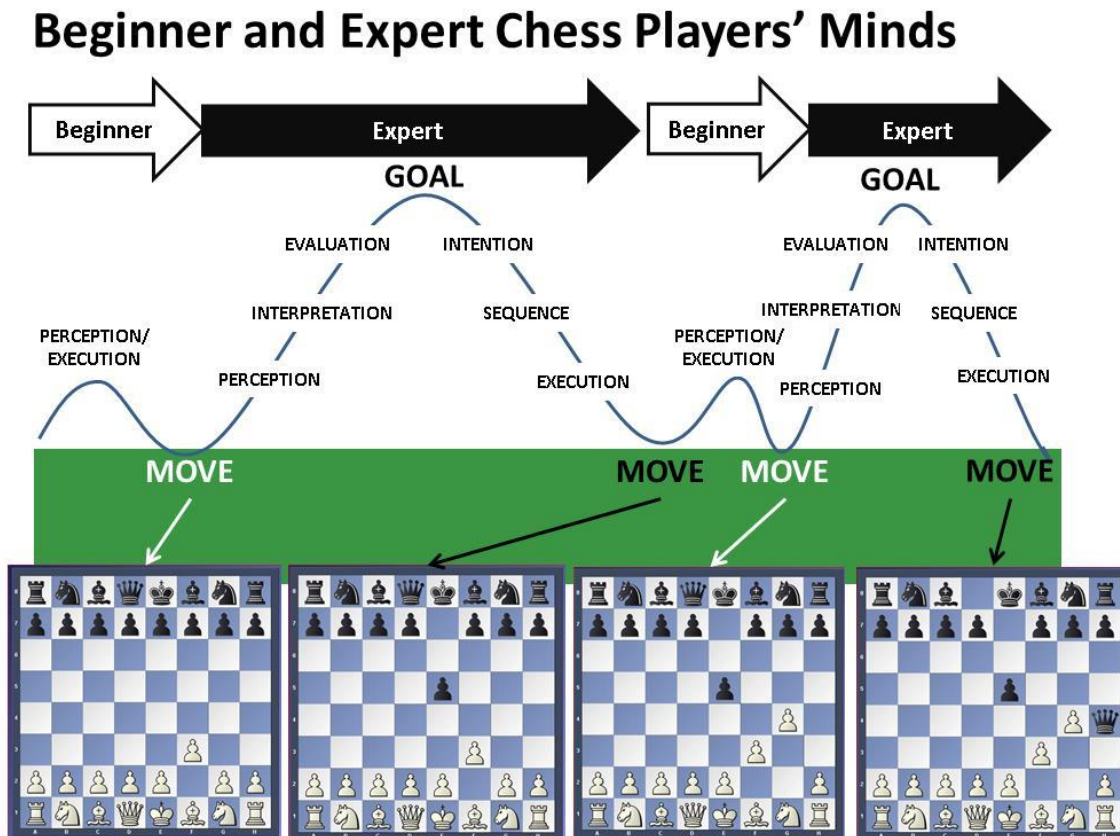


Figure 7 Fools Mate

Who hasn't seen this Fools Mate? This picture emphasizes the difference in learning and thinking in a beginning chess player and an expert using the Chess Architecture. The beginner knows how to move the pieces but not much else. The beginner in our example above moves 1.f3. The beginner does not know opening principles, tactical motives, strategic positioning or the wisdom that comes with effective thinking and learning over time. The expert does know all of these chess elements and moves 1...e5 taking control of the center and freeing the queen and dark squared bishop for development. The beginner answers with 2.g4. The beginner has no idea of what is coming next. The beginner has no basis for knowing that checkmate is coming. The expert plays 2...Qh4#. Checkmate in 2 moves! Crushing and embarrassing but if effective thinking and learning take place, it won't happen again.

There are those that say chess is 99% tactics. I think that chess is 100% about the best moves. If you don't know how to find the best move then you must learn how. The architecture of planning that is integrated into the Chess Architecture shows that tactical thinking is just one level above the operational level and that there are two higher strategic and goal levels. These two higher levels include the knowledge of what chess players call positional play and the wisdom gained from playing and studying 10,000 of your and grand masters' games. Chess is much more than tactics.

Chess Architecture in Practice

The following tables show one additional hierarchy level, basic English language interrogatives (and one imperative): why, what, how and act. They expand understanding and limit scope of the levels of the Chess Architecture. There are many chess openings but I will show only one simple example. Here is the first golden move of chess as envisioned by white:



Figure 8 Rachel Li at the world Open chess 2018 controlling the center

Level of Planning	Question Asked	Stage of Action	Action(s)	Level of Understanding
Goal	Why	Goal	In the opening, develop all pieces most effectively and efficiently as possible in order to checkmate black's K	Wisdom
Strategic	What	Intention	Control and occupy the center with pawns ⁴ to open lines for other pieces because these moves satisfy most effectively and efficiently goal	Knowledge
Tactical	How	Sequence	<u>Candidate moves</u> : only e4 and d4 satisfy control and occupy <u>Sequence</u> : e4 first because it opens lines for the Q and a B and is therefore most effective <u>Select Best Move</u> : e4	Information
Operational	Action	Execution	1.e4, press clock, record move	Data

Table 1 level of planning, question asked, stage of action, white's opening move followed by levels of understanding

⁴ I limit the moves to pawns to show the "10 golden moves of chess." In other openings knights can control center squares but do not open lines or occupy the center.

Here is an example of black's response applying all the steps of the CA:

Level of Planning	Question Asked	Stage of Action	Action(s)	Level of Understanding
Operational	Action	Perceive	See and record that White played 1.e4, press your clock	Data
Tactical	How	Interpret	White is occupying a center square e4 on white's side, controlling a center square d5 and a central square f5 on black's side, opening lines for white's Q and B on f1	Information
Strategic	What	Evaluate	White is developing as effectively and efficiently as possible	Knowledge
Goal	Why	Goal	In the opening, develop all pieces most effectively and efficiently as possible and/or interfere with opponent's plan to the maximum extent possible in order to checkmate opponent's K	Assimilated Knowledge
Strategic	What	Intend	Challenge white for the center and control and occupy the center at the same time	Knowledge
Tactical	How	Sequence	<u>Candidate moves:</u> 1...d5, 1...e5 as these are the only moves that challenge and occupy the center <u>Calculate candidates:</u> 1...d5 threatens to exchange center pawns 1...e5 controls and occupies the center with a pawn and makes 2. d4 difficult <u>Select the best move:</u> 1...e5 satisfies the strategy best	Information
Operational	Act	Execute	1...e5	Data

Table 2 level of planning, question asked, stage of action and, opponent's thinking action followed by levels of understanding

This is a simple example to reinforce that each level of thinking is distinctly different. Notice that the goal informs and constrains the strategy, the strategy informs and constrains tactics and tactics informs and constrains the operation.

CHESS ACTION PLAN

The action plan builds on everything covered and describes each step of the seven stages of action.

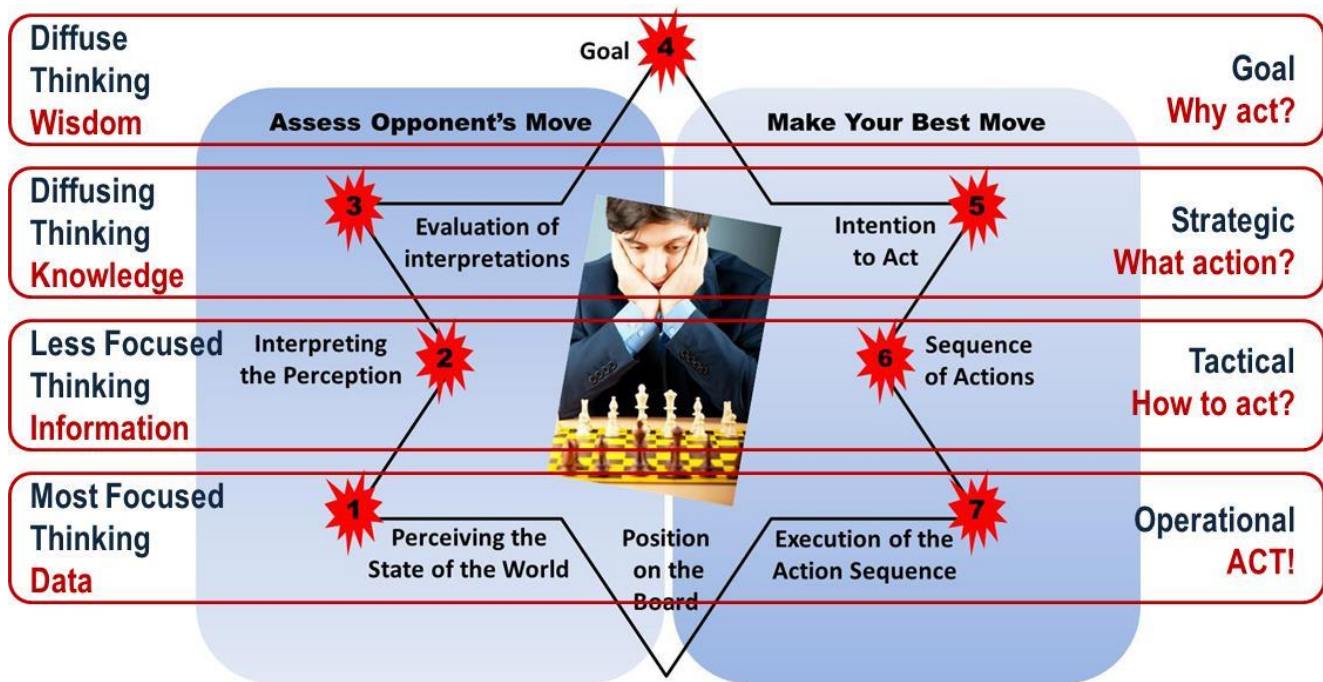


Figure 9 repeated here to help visualize the Chess Architecture while describing the steps of the seven stages of action

The architecture consists of four levels that contribute to understanding and constraining each step in the seven stages of action. The components of the four levels are named at the corners of each red outlined oblong box above. The levels themselves are also named shown in the seven stage of action shown below. Each stage is described and elaborated on briefly from each level of the architecture

1. Stage of Action: Perception

Observe and record your opponent's move.

a. LEARNING: FOCUSED THINKING

Have you seen this move before?

b. UNDERSTANDING: DATA

Did the move capture, attack or threaten something else?

c. PLANNING: OPERATIONAL

Was the move consistent with what you thought your opponent had planned?

d. REASONING: ACT

Is this what you thought your opponent would do?

2. Stage of Action: Interpretation

Try to understand what your opponent is trying to accomplish.

a. LEARNING: LESS FOCUSED THINKING

What is your opponent planning to do in the next 2 to 5 moves?

b. UNDERSTANDING: INFORMATION

Will the potential moves be a combination of moves that will cost you material?

c. PLANNING: TACTICAL

Is the combination consistent with what you thought your opponent had planned?

d. REASONING: HOW TO ACT

Is the combination what you thought your opponent would try?

3. Stage of Action: Evaluation

Assign values to the overall position using the elements of chess strategy: what space, force (material), time, harmony, and dynamics (tactics) are controlled or lost.

a. LEARNING: DIFFUSING THINKING

Study the entire position on the chess board.

b. UNDERSTANDING: KNOWLEDGE

How do your opponent's elements compare to your elements?

c. PLANNING: STRATEGIC

What needs to be changed to improve your position?

d. REASONING: WHAT ACTION

Is the position consistent with what you thought your opponent had planned?

4. Stage of Action: Goal

Compare and contrast your position with your opponent's position given your own experience and study of master games and decide if and why you need to change your goal.

a. LEARNING: DIFFUSE THINKING

Open your thinking to all the games you have played and studied.

b. UNDERSTANDING: WISDOM

Do I need to react to my opponent's threats or can I create greater threats of my own?

c. PLANNING: GOAL

Given your entire history of chess and the specific position, act accordingly.

d. REASONING: WHY ACT

Revise your goal if necessary and act accordingly.

5. Stage of Action: Intention

Given my goal I will create a strategic plan to capture, attack, or maximize the activity of my weakest piece.

a. LEARNING: DIFFUSING THINKING

Focus more on the position on the board

b. UNDERSTANDING: KNOWLEDGE

Maximum activity and coordination of pawns and pieces is a pattern of knowledge.

c. PLANNING: STRATEGIC

Capture if possible, attack if possible, or maximize activity of your worst piece.

d. REASONING: WHAT ACTION

Look for moves in forcing move order that capture if possible, attack if possible, or maximize activity of your worst piece.

6. Stage of Action: Sequence

Given my strategy I will create a tactical plan to select, calculate, evaluate and sequence the best moves.

a. LEARNING: LESS FOCUSED THINKING

Focus more on move orders that satisfy the strategy.

b. UNDERSTANDING: INFORMATION

The best move may not be the ultimate end of a sequence of moves or combination.

c. PLANNING: TACTICAL

For each candidate move: select, calculate, evaluate then sequence the moves.

d. REASONING: HOW TO ACT

Order or sequence candidate moves to achieve maximum effect.

7. Stage of Action: Execution

Given the best move sequence I will make the best move.

a. LEARNING: FOCUSED THINKING

Make the best move of a specific pawn or piece to the precise square.

b. UNDERSTANDING: DATA

Make and record your move [Piece Identifying Letter] at (if necessary for clarity) [File Letter (n) and Rank Number (x)] to [File Letter (n) and Rank Number (x)].

c. PLANNING: OPERATIONAL

Locate and prepare to move [Piece Identifying Letter] at (if necessary for clarity) [File Letter (n) and Rank Number (x)] to [File Letter (n) and Rank Number (x)].

d. REASONING: HOW TO ACT

I will be sure to move the right piece to the right square and not touch any other piece except to capture it or castle.

WHY GO THROUGH ALL SEVEN STEPS ON EVERY MOVE

Ideally a good player will go through all seven steps until the cycle becomes an unconscious habit. Once it becomes second nature to a player, exceptions can be made for time trouble, forced moves, memorized variations, or unforeseen situations.

Figure 10 below shows how beginners play chess. Beginners seem to only perceive an opponent's move and respond with a move right away without thinking almost as reflex action to a punch. Beginning and intermediate players will have a difficult time winning against higher rated players.

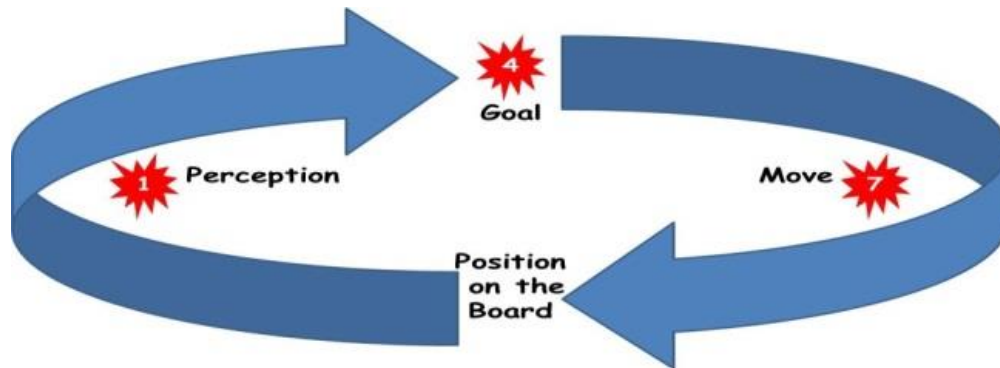


Figure 10 perception, goal and move based on goal only

Figure 11 below shows how intermediate players perceive an opponent's move, interpret it, plan tactics and make a good, but seldom the best, move. Playing this way you may win many casual games but you will seldom, if ever, win a rated tournament game. If you want to play chess well or play in chess tournaments, then avoid this kind of only tactical play.

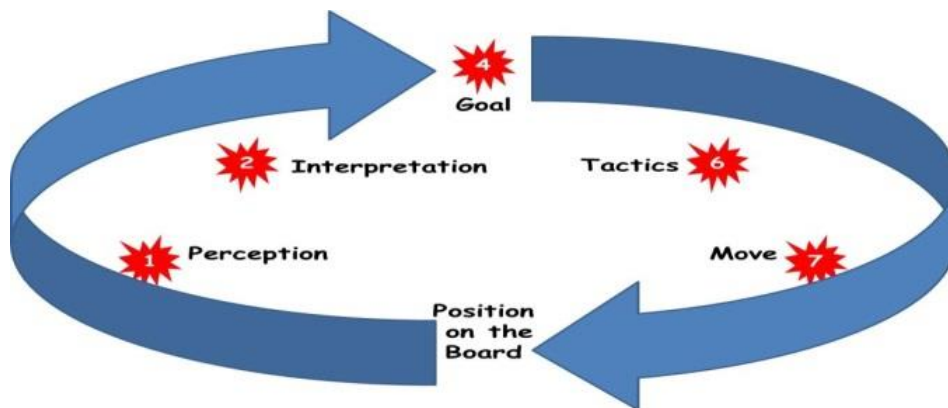


Figure 11 perceive, interpret, goal and tactics and move based on goal and tactics

Notice that the goal is always there. Every player wants to win. It is the cognition of the distinct levels of thinking that is missing. They have yet to emerge out of the background.

Figure 12 shows the way good chess players think and act all the time.

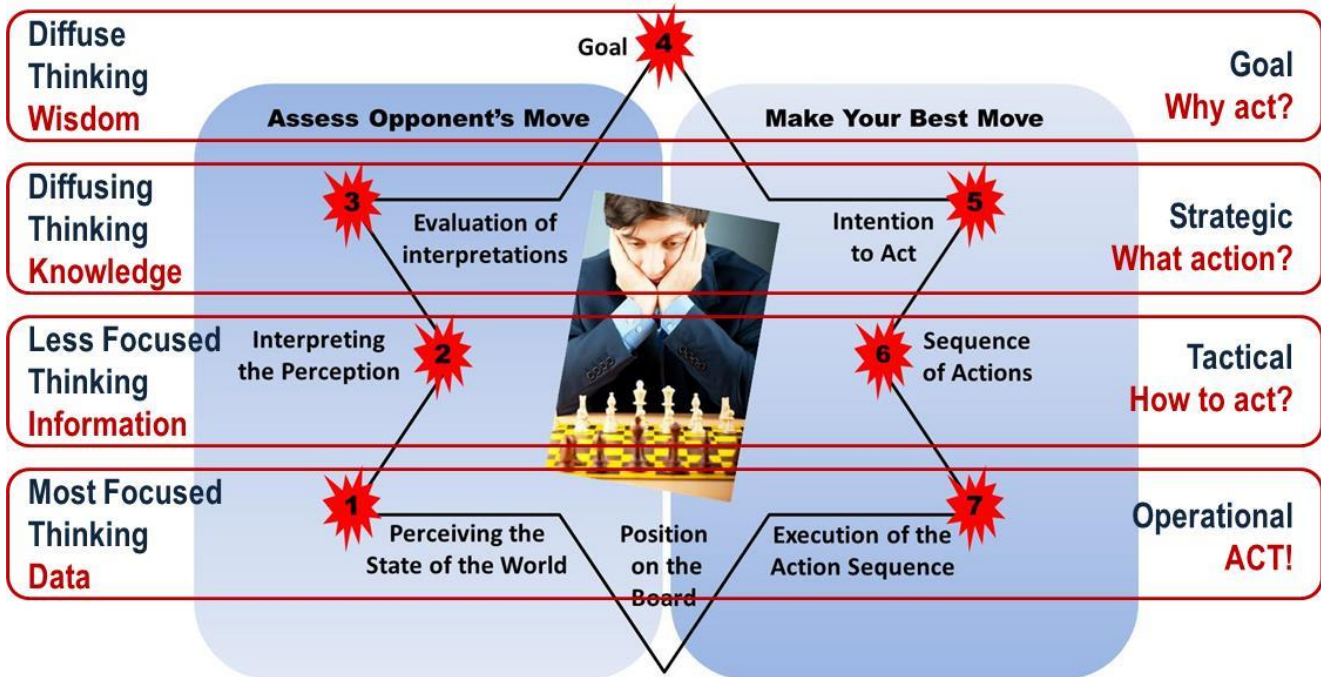


Figure 12 a chess player applying the full Action Plan with levels of hierarchy now understood

By now you are familiar with the levels Chess Architecture and the stages of action but we will review them to reinforce them in your memory.

Levels of learning and thinking (goal, strategic, tactical, and operational) and questions asked (why act, what actions, how to act) help you chart a course for the achievement of your goal, a plan. Goal level is planning to plan and guides and constrains strategic planning.

1. Strategic level plans the intention to act and guides and constrains tactical planning
2. Tactical level plans the sequence of actions and guides and constrains operational planning
3. Operational level plans execute the sequence of actions

Actions change the position on the chess board.

4. Operational level perceives, records and transmits position data to the tactical level
5. Tactical level interprets the data and transmits information to the strategic level
6. Strategic level evaluates the information and transmits knowledge to the goal level

CHESS SHORT ACTION PLAN

Short Chess Plan

Memorize and follow on the fingers of your left hand on every move.

2. Tactics

Analyze:
Strengths
Weaknesses
Opportunities
Threats

1. Operation

Perceive and record opponent's move

3. Strategy

Evaluate:

Space
Time
Force
Harmony
Structure
Dynamics

4. Goal

Synthesize:*

Contrast &
Compare =
Difference^o
Revise Goal?

5. Strategy

Activate:

Capture Material
Attack! Attack!
Maximize Activity

6. Tactics

Find Best Moves:

Select Candidate Moves
Calculate Variations
Evaluate Candidates
Sequence Move Order

7. Operation

Make your best move

* Determine if there is a need to revise your goal considering the difference between positions using comparisons and final evaluation.

Figure 13 short chess action plan for the left hand

The short chess plan shown in Figure 13 is intended to be used while you are playing over the board. Use your left hand if you are right handed or vice versa under the table so it won't annoy or alert your opponent. If you can't control your urge to move immediately without sufficient thinking then maybe you should use the hand that you move the pieces with! The operational level is already apparent to your senses so it doesn't need to be brought to your attention on one of the fingers. Each finger represents one of the remaining stages and the approximate height of opposing finger pairs and middle finger represent the levels of thinking. The Thumb and little finger represent the tactical level, the index finger and ring finger represent the strategic level, and lastly the middle finger represents the goal level. Open your left hand with the palm facing you before each move. Fold in each finger in order from the thumb to the little finger as you complete each step. It will help you remember the levels and stages and resist the urge to move too quickly.

WHERE ARE YOU AND WHERE DO YOU WANT TO GO?

If you have a USCF or ELO rating, is it where you want it to be? Probably it is not. Then use the following **Seven Levels of Change** to determine where you are and what you need to do to improve. Then drive the **Chess Architecture** fueled with the **seven stages of action** to get there.



Figure 14 Chess Architecture fueled with stages of action on the 7 levels of change highway

Seven Levels of Change – Improvement⁵

Einstein pointed out that "The significant problems we face today cannot be solved at the same level we were at when we created them." To get different results -- change -- we must do things differently. The framework of this model is divided into seven distinct levels -- from easy to impossible - across a spectrum of continual change (continuous innovation) over increasing levels of difficulty.

- LEVEL 1: Effectiveness DOING the right things
- LEVEL 2: Efficiency DOING things right
- LEVEL 3: Improving DOING things better
- LEVEL 4: Cutting/Stopping DOING things
- LEVEL 5: Copying DOING things other people are doing
- LEVEL 6: Different DOING things no one else is doing
- LEVEL 7: Impossible DOING things that can't be done

⁵ <http://www.thinking-expedition.com/change7.html>

Each level is progressively more complex, more difficult to undertake than the preceding level. Consider the seven levels of change in the context of moving into a new job or a new business activity to which you have not been exposed before.

Level 1: Effectiveness - Doing the Right Things.

The easiest change to make is to learn the basics - what are the right things to do and how to immediately change enough to become effective in a new job. The Pareto Principle states that 20% of the things being done actually yield 80% of the total payoff. To maximize effectiveness, energy must be shifted to and focused on doing that 20% (the right things).

Level 2: Efficiency - Doing Things Right.

Level 2 change requires a thorough understanding of all the aspects of the new job or business activity in order to identify and then focus on doing very well those things which have the most important impact and make the largest contribution. Level 2 changes are based largely on personally adjusting to new standards and procedures, and involve coaching or explanations by others familiar with the job or business activity.

Level 3: Improving - Doing Things Better.

Change at this level involves thinking about ways to improve or fine-tune -- ways to speed things up, shorten delivery time, increase functionality, reduce downtime. Level 3 change makes something more effective, more efficient, more productive, and more value-adding - frequently with customer input.

Level 4: Cutting - Doing Away With Things.

This level of change involves analysis of core functions and applies the Pareto Principle to focus on stopping doing things - cutting out the 80% of things that only yield 20% of the value. In the simplest case, change at Level 4 focuses on eliminating waste. If this can be done systemically while keeping all organizational interrelationships and subsystems in perspective, major company-wide results can be achieved.

Level 5: Copying - Doing Things Other People Are Doing.

Level 5 marks the transition from incremental to fundamental change. Copying, learning from, and "reverse engineering" can dramatically boost innovation at significantly lower costs than starting from scratch. Benchmarking how other organizations are doing things and then enhancing their processes is the hallmark of the successful innovator.

Level 6: Different - Doing Things No One Else Is Doing.

Change at Level 6 is about either doing something very different or doing something very differently - and transitions into degrees of novelty which not only move an organization "out-of-the-box", they move the organization into areas where nobody else is doing it. Level 6 is a shift into 3-Sigma thinking. Such trailblazing and greater degrees of risk-taking can bring about genuinely new things, often by synthesizing seemingly unconnected concepts and technologies - or by totally shifting perspective around the possible uses of a product.

Level 7: Impossible - Doing Things That Can't Be Done.

"What is today impossible, but if it were possible it would fundamentally change the way you do business?" Joel Barker's famous question reframes thinking extremely well for Level 7. Market constraints, resource limitations, or company culture are too often seen as insurmountable barriers. As a result, discoveries at Level 7 frequently build on major mind shifts connected with exploratory thrusts into the unknown - bold, significant and long-term visions and change so different that it cannot be compared to anything else known at the time.

FINAL THOUGHTS

Any change requires time, resources and personal energy. The higher the level of change, the more time, resources and personal energy the change will require in implementation. Further, it is not a straight-line relationship across the seven levels; it is geometric and explodes in terms of difficulty as the change level increases.

Now you have the vehicle, the Chess Architecture, the fuel, the seven stages of action, and the road to get there, the seven levels of change. All of this is about creating a habit of thinking while playing chess. There are plenty of resources for every phase and aspect of chess but virtually none on thinking. "Education in chess has to be an education in independent thinking and judgement" – Emanuel Lasker.

The goal of this Chess Architecture is to:

- 1. help create a habit in a chess player of**
- 2. thinking rigorously and**
- 3. at peak level**
- 4. on every move of**
- 5. every chess game through**
- 6. continuous conscious use in**
- 7. Practice.**