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Lean Learning Patterns. (CPD)<sub>n</sub>A vs. KATA

Javier Villalba-Diez,<sup>a</sup> \* Joaquin Ordieres-Meré,<sup>b</sup> Susana Rubio-Valdehita<sup>c</sup>

<sup>a</sup>Center for Leadership Mannheim, Biberach an der Riß 88400, Germany

<sup>b</sup>Universidad Politécnica de Madrid, Madrid 28006, Spain

<sup>c</sup>Universidad Complutense de Madrid, Madrid 28006, Spain

\* Corresponding author. Tel.: +34 601 151 023; fax: +34 601 151 023. E-mail address: [h4lean@gmail.com](mailto:h4lean@gmail.com)

**Abstract**

Evolving the organization means that developing new capabilities, identifying early and retaining talent are some of the major organizational challenges in the 21st century. Individual learning in organizations is not homogeneous and depends on a number of individual and environmental factors. In this paper, (CPD)<sub>n</sub>A (Check-Plan-Do-...-Act) is compared from a psychological and managerial perspective to other lean learning patterns (LLP), such as KATA. The purpose is to show the advantages of implementing (CPD)<sub>n</sub>A in creating the conditions necessary for organizational alignment.

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**Keywords:** KATA; (CPD)<sub>n</sub>A; NEMAWASHI; HOSHIN KANRI TREE.

**1. Introduction**

Organizations have no means other than individual POs to interact with the environment and process information. When learning, the PO interacts with the environment to gather data to use with any prior experience to form an internal representation of the environment [1]. Therefore, organizations can be considered to be interpretation systems [2] in which a categorization is proposed. The latter depends on the leader's beliefs about the environment (analyzable -or unanalyzable) and the organization's degree of intrusiveness (high or low) into it. A Lean Management System (LMS) is characterized by high intrusiveness into the environment. For this reason, this paper focuses on categorization, which depends on management's view of the environment.

Individual learning in an organization will be determined by the predominant leader's belief about the environment. Depending on this factor, organizations can be characterized into discovering and enacting organizations:

- In a “discovering organization,” leaders assume that the environment can be predicted and analyzed [2]. As a result, leaders attempt to adapt and learn by actively setting predictable performance goals for continuous improvement efforts.

Nomenclature	
PO	Process Owner. Any individual in the organization that owns a process.
(CPD) <sub>n</sub> A	Check-Plan-Do-...-Act
LLP	Lean Learning Pattern
LMS	Lean Management System
KATA	Repeating behavioural Pattern
LSN	Lean Structural Network

- Conversely, leaders in an “enacting organization” assume that the environment is unpredictable and malleable [2]. Therefore, they innovate and learn by trial and error.

Reputed lean scholar Fujimoto [3] coined the concept of organizational evolutionary learning capabilities by which he meant “an organization’s overall ability to evolve competitive routines” when analyzing the emergence of a highly complex and competitive LMS by creating certain LLPs: lean oriented learning routines for systematic variability reduction [4] at an individual level.

Organizational learning might be just a myth. Those who learn in organizations are people [5]. However, it continues to be a powerful metaphor. Peter Senge defines organizational learning as a process in which people are “continually learning how to learn together” [6]. What characterizes an organization is the ability of its members to reach convergence [7] in order to achieve organizational goals together. This process of achieving consensus can only be realized if the organization as a whole interprets its environment coherently.

The complexity of such an environment is increasing exponentially and organizations in the 21st century should respond to this challenge with increasing organizational complexity [8]. In an environment of increasing complexity, LMS should support the most important aspect of strategic planning, namely “a dialogue through which knowledge is shared and consensus is achieved and commitment towards action and results is built” [9] to achieve the LMS paradigm of continuous process variability reduction [4].

Such an organizational strategic consensus-seeking NEMAWASHI process and the conditions for it have been defined and quantified in [10]. This means that the prerequisite for an individual LLP that seeks to successfully evolve organizational learning capability and, thus, to enable complex and competitive LMS to emerge is to fulfill the NEMAWASHI conditions.

Therefore, two of the main challenges when designing such a LMS are to design and implement properly an LLP that enable a individual learning and to ensure that this LLP supports organizational alignment.

In order to provide the necessary framework, this paper adopts the organizational network paradigm [11]. Within this framework, a context has been chosen that stands on a solid ground of research that enables organizations to be viewed as information exchange open systems [12, 13]. LLPs are embedded within this context, thereby enabling Lean Structural Networks to be created by linking organizational POs [14].

In order to illustrate this, we have chosen two main

exponents of LLPs that depend on the leader’s view of the environment:

- KATA [15] as an example of an LLP applied within a discovering management view of the environment.
- (CPD)<sub>n</sub>A [14] as an example of an enacting management view of the environment.

The structure of this research paper now addresses its contribution. First, by comparing two LLPs that are used widely in the industry, KATA and (CPD)<sub>n</sub>A, the paper shows why and how KATA is intrinsically unable to fulfill NEMAWASHI and, therefore, to operate on an organizational complex level, and also why and how (CPD)<sub>n</sub>A can. The consequence is that (CPD)<sub>n</sub>A will enable the design of LSNs like those that are achieved by implementing HOSHIN KANRI TREE [16], whereas KATA will not. Finally, the paper offers several propositions that have management implications for lean leaders who seek to develop organizational learning capabilities for organizational alignment. The paper ends by showing avenues for further research and related limitations.

## 2. (CPD)<sub>n</sub>A vs. KATA

Our review of LLP begins by showing in Table 1 what LLP, (CPD)<sub>n</sub>A and KATA, have in common and how they differ from a psychological and a managerial perspective.

Based on the KATA algorithm, it cannot be concluded that the NEMAWASHI conditions are fulfilled on an organizational level. The reason is that setting target states for individual KPIs does not guarantee that there will be equilibrium between competition and inhibition for KPIs, which is essential for organizational consensus.

In order to be mathematically precise, equation (1) expresses the NEMAWASHI dynamics as described in [10],

$$dx_i^{**}/dt = x_i^{**} \cdot (r_i - \sum_j a_{ij} x_j^{**}); i, j = 1, 2, 3 \quad (1)$$

with  $x_i^{**}$  being the value of the  $i^{\text{th}}$  KPI of the  $i^{\text{th}}$  value stream.

Equation (2) expresses the first condition for asymptotic stability

$$\left. \begin{aligned} m_{11} &= a_{22} * a_{33} - a_{23} * a_{32} > 0 \\ m_{22} &= a_{11} * a_{33} - a_{13} * a_{31} > 0 \\ m_{33} &= a_{11} * a_{22} - a_{12} * a_{21} > 0 \end{aligned} \right\} \quad (2)$$

Table 1. (CPD)<sub>n</sub>A vs. KATA.

	LLP (See Figure 1)	What (CPD) <sub>n</sub> A and KATA have in common	Differences from a psychological perspective	Differences from a managerial perspective
<b>KATA</b> [15]	<p>1. Set direction for Challenge</p> <p>2. Understand the current condition. Typically, one does so by going to Gemba [17].</p> <p>3. Establish the next target condition. This “typically represents a step closer to the vision and a challenge that goes somewhat beyond current capability.”</p> <p>4. Conduct Experiments to get there through PDCA. Here, PDCA is perceived as a problem solving process.</p>	<p>Both (CPD)<sub>n</sub>A and KATA begin by setting a direction or challenge:</p> <p>* KATA defines it as a “vague,” far-away vision.</p> <p>* (CPD)<sub>n</sub>A understands this direction-giving premise as a common understanding by all POs involved that the process needs to be continuously improved towards process variability reduction.</p> <p>Both (CPD)<sub>n</sub>A and KATA continue by grasping the current condition of the process by going to Gemba [17].</p>	<p>There is much psychological evidence [18] that setting “target conditions” or active goals as the information used during the chosen action. Information that is relevant to a goal is used, but information that seems irrelevant to goal achievement is neglected. This might have undesired consequences when attempting to achieve consensual solutions between different POs within complex dynamic environments.</p> <p>The “goal compatibility” framework [19] suggests that POs evaluate objects relative to active goals and so “the value of an object is a function of its compatibility with that of the active goal.” Thus, these objects, which can be any assets such as people, cash or equipment, are means by which to achieve the goals.</p> <p>These might be some of the reasons why scholars [20] have reported that the systematic harm caused by goal-setting, including a “narrow focus that neglects non-goal areas, leads to a rise of unethical behavior, distorted risk preferences, corrosion of organizational culture, and reduction of intrinsic motivation” among others.</p>	<p>The assumption that target conditions can be set means that organizational leaders assume that the environment is predictable and can be analyzed. This is typical in “discovering organizations.”</p> <p>With increasing complexity, “target conditions” will increasingly and dynamically depend on other dynamically changing “target conditions” that are a priori unrelated to the challenge. As a result, it is not always possible to achieve the NEMAWASHI conditions with KATA. This invalidates KATA as an LLP that supports successful evolution of organizational learning capabilities. This is shown in the next section by an example of a real case.</p>
<b>(CPD)<sub>n</sub>A</b> [14]	<p>1. <b>Check or Commitment.</b> In the Check Phase there are three sub-phases. First, examine the process at Gemba [17]. Next, set a direction for improvement by agreeing that continuous improvement is a common need and achieving consensus is how to achieve success. This is done by establishing a process KPI (Key Performance Indicator) in the HOSHIN KANRI process [21] that the sender PO uses to measure process performance. Finally, the current state of this KPI is measured.</p> <p>2. <b>Plan or Process-Priority Analysis.</b> There are three sub-phases in the Plan Phase. First, understand the current state of the process using a process mapping tool [22] (Wagner and Lindner, 2013). Next, prioritize the main sources of MUDA, MURA and MURI (3M) [23]. Finally, analyze the main source of the 3Ms within the process boundaries.</p> <p>3. <b>Do or Action.</b> In the Do Phase, we work on the process. After deciding why 3M are occurring, the PO defines an action to improve the process by sustainably reducing internal process variability. It is important here to enhance the interdependent nature of processes.</p> <p>3. Repeat numbers 1 to 3 “n” times.</p> <p>5. <b>Act or Anchor Learning or Standardization.</b> The Act Phase is where anchoring and transforming the active learning into organizational learning occurs. After reaching a plateau in the KPI, the knowledge that was developed in process management becomes a Standard (understood as the best known way to conduct the process).</p>	<p>It is important for creating psychological empowerment that the receiver PO explains why such a KPI is important for success in order to create meaningfulness for (CPD)<sub>n</sub>A in the sender PO. Although the sender PO decides ultimately what the KPI is to be optimized with (CPD)<sub>n</sub>A, it is important for creating a sense of fairness in the PO that there is agreement on the KPI.</p> <p>The direction that is set with (CPD)<sub>n</sub>A is the systematic reduction of 3M. This is not an active goal, but a “prevention goal” [19]. In contrast to active goals, such as “target conditions,” preventive goals trigger motivational responses that are associated with responsibility and security and that regulate behavior by minimizing the presence of negative outcomes [24].</p>	<p>Because of the awareness of organizational leaders that processes are interdependent systemic complex realities, the environment in this case is malleable and unpredictable. This is typical of “enacting organizations.”</p> <p>The continuous improvement of the process is based solely on two pillars: (1) a common understanding of the current state of the process and (2) an agreement that the process should be continually improved towards variability reduction (this is the only strategic direction required).</p> <p>With increasing complexity, the (CPD)<sub>n</sub>A logic remains untouched, because it is based solely on agreement on the need for continuous improvement and an understanding of the current state.</p> <p>The NEMAWASHI conditions may or may not be attained depending on the organizational decision on different KPIs. The latter should take place at a higher organizational level by the systematic implementation of the HOSHIN KANRI TREE, as explained in [16].</p>	

Nothing in KATA's algorithm implies that a target state of KPI  $x_2^{**}(t+1)$  is the target state of KPI  $x_3^{**}(t+1)$ , both of which are understood to be active goals. Since this is the general case, condition (2) is intrinsically not fulfilled. This is because there is no guarantee that the measure of competition between KPI  $x_2^{**}$  and KPI  $x_3^{**}$  as expressed by  $a_{22} \cdot a_{33}$  is never less than the potential inhibition effect that has KPI  $x_2^{**}$  provoked by changes on KPI  $x_3^{**}$ , as expressed by  $a_{23} \cdot a_{32}$ .

In propositional logic terms, the truth-functional tautology or theorem of propositional logic can be formulated like  $(P \rightarrow Q) \rightarrow (\neg Q \rightarrow \neg P)$  [25], because:

- (P) the proposition "KATA is implemented"
- (Q) the proposition "the conditions for alignment described in (1) and (2) are not always fulfilled"
- $(\neg P)$ , as well as  $(\neg Q)$ , are respectively the opposite propositions.

Because the implementation of KATA implies that the conditions for organizational alignment are not always fulfilled,  $(P \rightarrow Q)$  is true. Thus, we can conclude that, when the conditions for organizational alignment are always fulfilled,  $(\neg Q)$  implies that KATA is not implemented  $(\neg P)$ .

The following real example shows this in practical terms. Imagine a factory whose factory manager is under cost pressure and decides to implement KATA as an empowerment program for all factory leaders. The following steps indicate how this happens:

- The strategic target state set by the factory manager is to reduce the overall product cost by 10%.
- The HR Manager, reporting to the factory manager, in order to support the strategic goal, sets a target condition of increasing the temporary production workforce rate by 20%.
- The Production Manager implements this action together with HR.
- Six weeks later, the quality costs have increased by 50%. This can be interpreted as being a direct consequence of the active target state that the HR Manager announced, because temporary workers do not control the process as well as experienced workers do.
- Subsequently, the Quality Manager implements KATA to reduce quality cost. The Cpk value is way under 1,33 and this needs to be corrected by increasing end product control to 100%.
- This action increases the overall cost of the product. So, the factory manager increases the overall cost reduction target state to 20% six months after having begun the KATA program.

However, because the  $(CPD)_nA$  seeks the systematic reduction of the variability of the related KPI, the  $(CPD)_nA$  algorithm enables the PO to adapt the actions to the passive goal of process variability reduction in order to balance, if detected, the effects of competition or inhibition from other related POs that that are implementing  $(CPD)_nAs$ .

In propositional logic terms again,  $(P' \rightarrow Q') \rightarrow (\neg Q' \rightarrow \neg P')$  since:

- (P') proposition "(CPD)<sub>n</sub>A was implemented correctly"

- (Q') proposition "the conditions for alignment can be fulfilled"
- $(\neg P')$  and  $(\neg Q')$  are respectively the opposite propositions.

Since  $(P' \rightarrow Q')$  is true, the implication is that, if the conditions for alignment cannot be fulfilled,  $(CPD)_nA$  was implemented incorrectly. In other words, if the nature of strategic KPIs do not support a consensual VS alignment, the successful individual implementation of  $(CPD)_nA$  will not be possible because the variability of the related KPIs will not decrease.

The previous example could have been solved with  $(CPD)_nA$  as follows:

- The strategic target state that the factory manager sets was to reduce overall product cost by 10% and he decides to achieve this by  $(CPD)_nA$  with KPI product cost.
- The factory manager measures the KPI (Check). Then, he maps the VS (Plan). Next, he prioritizes the main sources of 3M on the KPI and discovers that the cost of personnel is impacting his product cost greatly (Plan). Subsequently, he conducts an analysis of the cost of personnel finishing the (Plan). Then, an action to reduce personnel expense is outlined for the HR Manager.
- The HR Manager implements  $(CPD)_nA$  after measuring the KPI (Check). Then, he maps the process (Plan). Next, he prioritizes the sources of 3M in the personnel cost (Plan). He discovers that production and quality management are not working together. His action (Do) is to appoint a group of operational leaders who will work together to reduce personnel expense by a consensual elimination of waste in the process by  $(CPD)_nA$ .
- Subsequently, the production manager and quality manager must work together to support the VS. If the cost of quality rises because of an action of the production manager, this action will not be performed in production. In this way,  $(CPD)_nA$  reduces misalignment in a process of continuous improvement.

### 3. Propositions and Management Implications.

After having described the differences between both LLP KATA and  $(CPD)_nA$  theoretically and in a practical case, we state the following propositions and related management implications:

**Proposition 1.** KATA is a valid LLP for managerial individual empowerment within discovering organizations. However, it cannot create the conditions that are necessary for NEMAWASHI.

**Management Implication 1.** The fact that a management method, such as KATA for instance, is easy to understand and explain is typically used by consultants to generate an enormous revenue from individual coaching and empowerment sessions.

Leaders should be aware that empowerment KATA programs may become a great waste of time and PO illusion, even if using other organizational approaches to alignment, such as HOSHIN KANRI, because KATA does not create the conditions that are necessary for NEMAWASHI.

**Proposition 2.** (CPD)<sub>n</sub>A is a valid LLP for managerial individual empowerment within enacting organizations. Furthermore, it is able to create the conditions that are necessary for NEMAWASHI.

**Management Implication 2.** (CPD)<sub>n</sub>A is a more complex LLP than KATA and takes the inexperienced PO more time and effort to learn. However, it delivers a crucial competitive advantage. It prepares the organization to follow a solid path towards organizational alignment. This can be achieved by expanding the Lean Management effort by company-wide shop floor management efforts, such as HOSHIN KANRI TREE.

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