Finding Standards, Routines and Non-Routines in Toyota Production System (TPS): Standardization without Standardization? [1]

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Abstract

Organizational routines are central features of human organizations (Feldman, 2003). While recognized as an essential aspect of organized work, the study of organizational routines has been at the centre of an academic debate. On the one hand, routines are a well-known source of inertia (efficiency focus) (Gersick & Hackman, 1990). On the other hand, some contributions have argued that organizational routines can also be an important source of flexibility and change (Feldman, 2000).

Taking the routine's debate into account (efficiency versus flexibility), we argue that routines can change be flexible, while at the same time being a strong platform of homogeneity. In this participatory research we accompanied practitioners in the application of process improvement methodologies during a six-month stay. Based on this empirical study, we propose a macro and micro theory framework using a metaphor: a ship and an anchor. This metaphor helps us to explore the nature of phenomena at one of the Toyota plant (standardization without standardization).

Keywords: organizational routines, standardization, non routines, competitive advantage, Toyota Production System.

Introduction

Today, organizations worldwide have to cope with strong competition and a dynamic environment as market conditions are changing rapidly while customers are more demanding. This in turn requires organizational innovations that are able to capitalize on the innovativeness, knowledge and skills of employees. In addition, management methods are required to assure flexibility in answering to changing customer needs (Adler *et al.*, 1999) and work process need to be managed efficiently and strictly (Armistead, 1996). Consequently, knowledge management researchers are dealing with at least three main questions in order to understand and explain the following organizational challenges: How do organizations achieve competitive advantage? Why are some organizations better than others in responding to environmental changes? And how can organizations be, at the same time, flexible and predictable, innovative and efficient?

Organizational routines are central features of human organizations (Feldman, 2003) and we argue that they are central features for answering the three questions raised above. Since the introduction of the concept by Stene (1940), organizational routines have been credited as the primary means by which organizations accomplish much of what they do (Stene, 1940; March & Simon, 1959).

While recognized as an essential aspect of organized work, the study of organizational routines has been at the centre of a controversial academic debate. On the one hand, routines are a well-known source of inertia and inflexibility (Hannan & Freeman 1983; Gersick & Hackman, 1990). From this perspective, daily work is perceived and conceptualized as stable, or as “regularity”, and it is a defining feature of bureaucracies. Scholars on this side of the debate argue that routines are an antithesis of flexibility and change, locking organizations

into inflexible, unchanging patterns of action, On the other hand, some contributions have argued that organizational routines can also be an important source of flexibility and change (Feldman, 2000). In that sense, Feldman (2003) argued that organizational routines have been missed when they are seen through other theoretical lenses. She suggested that routines have the capacity to retain history and thus lead to inertia, but at the same time they can also promote change (Feldman, 2003).

Drawing on this new perspective, we develop and base our paper that pursues two main objectives: a) To visualize and understand the relationship between the organizational and the individual dimensions that shape organizing process such as work's standards, routines, and non-routines; and b) how these standards, routines and non-routines shape a possible competitive advantage for the firm. Taking the routine's debate into account (efficiency versus flexibility – standardization versus change), this paper aims to shed light on these issues. In that sense, we argue that routines can change be flexible, while at the same time being a strong platform of regularity or homogeneity, therefore allowing both elements (standardization versus flexibility) to work together under the same framework. In order to explain our argument, we first set the theoretical stage of organizational routines, standards, and non routines. Next, we present an empirical case study performed in one of the Toyota Motor Corporation plant, located in the Aichi (*Cho*) prefecture in Japan, where we studied the practice of process improvement.

In this participatory research we accompanied practitioners in the application of process improvement methodologies during a six-month stay. Based on this empirical study, we present our findings with some empirical on the issue of organizational routines, standards and non routines in the context of the process standardization and improvement practice.

Particularly, we propose a macro and micro theory framework using a metaphor: a ship and an anchor. This metaphor helps us to explore the nature of routines, standards and non routines in process improvement at Toyota plant.

Understanding organizational routines, standards and non routines

Organizational Routines

In the practitioner literature the term organizational routine is widely used (Prusak, 2001; Bennis & Towsend, 2007). A possible explanation for the popularity of the term may well be that routines represent a good way to explain our work methods. In fact, much of the work in organizations is performed through routines (March & Simon, 1959; Cyer & March, 1963). Regarding the importance of the routines in an organization's life, some scholars argued that without routines organizations would loose efficiency as structures for collective actions (Cohen & Bacdayan, 1994). However, conceptualizing routines in a rigorous way is remarkably difficult (March & Simon, 1959; Pava, 1983; Cohen & Bacdayan, 1994).

Feldman (2000, p. 611) defined routines as: *"repeated patterns of behaviour that are bound by rules and customs and that do not change very much from iteration to another"*. This definition describes the stability feature of routines. From a different standpoint, Cohen and Bacdayn (1994, p. 555) argued that organizational routines are: "*patterned sequences of learned behaviour involving multiple actors who are linked by relations of communication and/or authority*". In the same line, Feldman (2003, p. 96) later defined them as: "*a repetitive, recognizable pattern of interdependent action, involving multiple actors*". Both definitions provide a description of some of the characteristics that must be present for an

action to be called an organizational routine. In fact, routines appear prominently and persistently in descriptions of organizational action (Marsh & Simon, 1959; Nelson & Winter, 1982; Levitt & March, 1988).

These definitions clearly merit deeper explanation since routines are a recognized feature of organizational behaviour. Routines fall into the category of task performance and standard operating procedures as identified by Cyert and March (1963). They also fit well with Nelson and Winter's definition that stated *"that range from well-specified technical routines for producing things through procedures for……"* (1982, p. 14) and with the definition proposed by Pava (1983), who defined routines as: *"processes are characterized as systems that address familiar but slightly dissimilar events through repetitive planning systems, decisions rules and algorithms, which lead to routinized behaviour"*.

The majority of these definitions have focused on the stability of routines (Gersick & Hackman, 1990). In fact, some other authors argued that organizational routines are a source of inertia and inflexibility (Hannan & Freeman, 1983). This understanding of organizational routines has deep roots in social theory, as reflected in writings on bureaucracy. Stability or continuity is a defining feature of bureaucracies (Weber, 1947). Organizational routines and rules have been seen as an important source of accountability as well as a source of stagnation (Weber, 1947; Crozier, 1964). From a different point of view, following Cyert and March's concept of adaptation (which they refer to standard operating procedures), it is possible to argue that "because many of the rules change slowly, it is possible to construct models of organizational behaviour that postulate only modest changes in decision rules" (1963, p. 101). Nelson and Winter also acknowledge the possibility of change, which they refer to as "mutation" (1982, p. 18). Furthermore, some researchers have suggested that the

stability of organizational routines is attributable, at least in part, to their being stored as distributed procedural memory that is not readily available for discursive processing (Cohen & Bacdayan, 1994).

Recent research argued that organizational routines have been missed when they are seen through other theoretical lenses (Feldman, 2003). In her research, Feldman (2003) observed hiring, training, budgeting, and moving processes of students into resident halls at the beginning of the academic year. She arrived to the conclusion that organizational routines are not always "stable and inert", but they have the potential to change in an internal dynamic (Feldman, 2000, 2003). By focusing on the improvised aspect of routines, Feldman (2003) concluded that the contingent and potentially contested nature of routines is a source of their variability. Therefore, although routines have the capacity to retain history, which can lead to inertia, routines can also generate variety (Feldman, 2003). In what regards to the organizational context, she argued that it is an important variable that can encourage change of organizational routines, and she also referred to performance as an important and necessary aspect for things to actually happen (Feldman, 2003).

Standards and Organizational Routines

Some scholars argued that organizational routines are similar to programs or performance programs (Cyert & March, 1963, March, 1991). *Standards Operating Procedures* are the archetypical example or performance programs, guidelines or rules. For Masao Nemoto (1987), the concept of standardisation is linked to a systematic process for regulating, normalising, and establishing work methods regarding key organisational variables and is expressed through processes, procedures, and work guidelines and instructions. According to Nemoto's definitions all employees have to follow *standards* in the work floor in order to

process the performance program. This mechanism allows workers to choose and make decisions on working methods. Therefore, at the most basic level, *standards* are applied to activities that are repetitive in an identical fashion (Takeyuki, 1995). An assumption of the classical quality management literature is that *processes* are identical or almost identical to activities performed towards a predetermined aim (Lillrank, 2003). These may be called *standard process* or *standard operating procedures (SOP)* (Lillrank & Liukko, 2004). For *process* we mean a *business process*, that is, a sequence of different steps that follow each other or proceed in parallel in order to accomplish something (Davenport, 1993, p. 5). Such SOPs have boundaries, they accept only pre-defined input, and have procedures to turn input into output. Thus, given targets should be achieved if an SOP is meticulously followed. If this not the case, deviations may have been caused by internal deficiencies of the process (Lillrank & Liukko, 2004).

Through these lenses, organizational routines are considered another type of process. Thus, they have one or more types of inputs, and two or more types of alternative outputs. The essential feature when managing routine processes is not mindless, defect-free repetition, but assessment and classification of input, and selection from a finite set of alternative guidelines, procedures and actions (Lillrank, 2003). For instance, Lillrank and Liukko (2004) framed an example of routines in health care. They showed a health care activity (i.e. how to clean skin before any surgery) and they explained that there is a detailed manual listing all steps for cleaning (standard). The input, soap and antibacterial liquids can be standardized to some extent, as well, as the procedures for cleaning. However, Lillrank and Liukko (2004) argued that in some situations the actual condition of the skin of certain patients can not be standardized. Therefore the skin cleaning procedure must be adjusted to fit the actual state of the input (i.e. the condition of the patient). On the other hand, Adler *et al.*, (1999) proposed

another example of routines as an important element for process change. They showed that NUMMI plant following Toyota's policy conducted a "reflection-review" (*Japanese Hansei*) about the production process of 1993 car models. In Toyota this routine (reflection-review process) has not been documented as a typical SOP (Liker, 2004). In fact, according to Adler *et al.*, (1999) it is just a series of guidelines, some objectives and politics (inputs) that any Toyota's plant and group suppliers has to operate according to their context and conditions. In other words, an assessment of the conditions of the particular situation is made, and guidelines or procedures are activated to derive a plan that guides action.

Non Routines and Organizational Routines

Thus, organizational routines can be seen as one product of organizational learning, because organizational learning promotes reduced variability, standardization, and the avoidance of failure (March, 1991). According to Feldman (2003) this explanation suggests that routines arise because they are functional; they minimize cost and increase managerial control. For Pavitt (2002) besides standards and routines, we can consider also for knowledge utilization *non routines*. Non routines are a process too (Lillrank & Liukko, 2004). Nevertheless non routines processes differ from routines in that input is vague and not readily classified into categories to which certain guidelines, procedures and actions could be linked (Lillrank & Liukko, 2004). In that sense, non routine processes is designed to address non-predictable, surprising and unfamiliar events through inquiry and learning systems, and capacity for problem solving (Lillrank, 2003). In fact, if we can establish a target, the aim must be the search for new information, iterative reasoning and trial and error.

Organizational Routines as a possible source of competitive advantage

Finally, many organizations employ meta-routines (routines that change routines) such as Continuous Improvement, and Process Improvement as a means to generate change (Hackmand & Wageman, 1995; Bessant & Caffyn, 1997; Garvin, 1998; Bessant & Francis, 1999). Meta-routines have also been theorized as a mechanism for generating "dynamic capabilities" (Teece *et al.*, 1997).

Other authors have also argued that organizational routines foster the perceived legitimacy of organizations as institution (Feldman & March, 1981), or as unique and integral organizational management system which can produce stronger capabilities, which are difficult to reproduce in other organizations (Fujimoto, 1994; Teece *et al.*, 1997; Spear & Bowen, 1999; Eisenhardt & Martin, 2000; Liker, 2004). According to Teece *et al.*, (1997, p. 518) competitive advantage of firms lies with its managerial and organizational processes, shaped by its (specific) asset position, and the paths available to it. These authors refer to managerial and organizational processes as the way things are done in the firm, and they also argue that they could be routines or patterns of current practices and learning. Thus, the concept of process is very important for firms it allows them to integrate and coordinate all their operations. How efficiently and effectively this integration is achieved is of great importance for the competitive advantage of the firm (Aoki, 1990).

A number of empirical researches provide support to the notion of organizational process as routines of learning that can represent a competitive advantage for the firm (Garvin, 1988; Henderson & Clark, 1990; Clark & Fujimoto, 1991). Clark and Fujimoto (1991) also reveal

the role played by coordinated routines. In fact, the authors go further in claiming that there is a significant difference between standards (micro level) and routines (macro level) in the impact on performance variables such as development costs, development lead times and quality, which may consequently have an impact on the competitive advantage. Some good examples of this argument in the literature are “Lean Productions Models” or “Just-in-time production models” (Womack *et al.,* 1990). Finally, drawing on the routines and meta-routines theory, in the following section, we describe how routines, standards and non routines represent a source of continuous process improvement using standardization but without standardizing, looking at Toyota’s work processes and methods.

Research Methodology

Case Selection and observation routines

We conducted a single case study research in one of the plant of Toyota Motor Corporation located in the Aichi province in Japan (Eisenhardth, 1989; Yin, 2003). Within this context, we studied the practice of process improvement. The reason to choose this company is due to the fact that Toyota Production System (TPS) was not easy to replicate in the occidental automobile’s industry (Schroeder & Robinson, 1991; Spear & Bowen, 1999). Some simple arguments point out that the reason for Toyota Production System’s success lies in its cultural roots. Meanwhile authors argued that this particular characteristic (the TPS) can be considered as a set of capabilities which generate a strong competitive advantage (Fujimoto, 1994; Takeyuki, 1995).

In addition, Toyota is known for having been implementing process improvement and process innovation techniques for many years, which has raised Toyota’s performance and

effectiveness (Liker, 2004). Besides, Toyota's process improvement's practice involves innovative and improvement activities across the workforce (multiple actors characteristic) (Nelson & Winter, 1982; Pavitt, 2002), which in turn requires specialized knowledge and high levels of employee participation on the routines (Imai, 1997; Suárez-Barraza, 2007). Consequently, this specific practice was very appropriate for the objectives of this study. Regarding SOPs, they should be followed by employees if given targets are to be achieved (repetitive action's characteristic). If this is not the case, deficiencies are corrected and procedures are improvement by Kaizen (Japanese word for Continuous Improvement) methodologies such as: *Quality Control Story* (problem solving methodology) (Kume, 1985) and quality circles or Kaizen teams (Imai, 1986; Suárez-Barraza, 2007; Suárez-Barraza and Lingham, 2007).

In our fieldwork, we focused on routines that are repeated every week and that involve many workers at Toyota plant shop floor. We focused on this kind of routines because they are regular, repetitive, and standardized. Another important reason was each routine is an integral part of the process improvement daily routine of a Toyota's worker. Kaizen's engineers (foreman) helped us to identify two routines of the process improvement approach: 1) 5'S methodology (housekeeping activities such as organizing, classifying, sorting out, cleaning, etc.) and 2) Quality Control (QC) Story through Kaizen teams. Within each routine there are multiple routines. Besides, workers have a good understanding of the rules, standards and actions implied. In fact, one of them affirmed that *"now we are doing the Seiri (sorting out and classification of the production's materials and tools) step of the 5'S"* or *"now we are operating the standard number xx of the four step of QC Story"*.

In the following sections we describe how we gathered and analyzed information of the two routines.

Data gathering

This empirical research proposes to analyse the process improvement practice (Toyota Production System) through organizational routines lenses. We gathered data in two stages. The first stage involved 5 formal and unstructured interviews with Toyota plant's employees (1 section chief, 2 foremen and 2 team leaders). In these interviews we asked them about the objectives of their jobs and how they performed them. All interviewees were integral part of a Kaizen training program in Toyota plant (Coughlan & Couglan, 2002). These interviews allowed us to know more about the work and the particular culture of the Toyota plant's shopfloor, and about how work processes were operated and improved, how work cells *(unit of production process)* were organized and how they were coordinated with other work cells of the process. Based on these interviews we focused on the two routines mentioned above, which are regarded as standard methodologies and techniques.

During a six-month-stay we observed this process improvement methodology. We participated in improvement or Kaizen teams meetings relevant to these routines. Sometimes, we attended also chief and foreman meetings and trainings. We shadowed both foreman and team leaders (one foreman and two team leaders) and workers (twelve people or one Kaizen team) during the time when they were particularly engaged in the routines. During six month we also had the opportunity to have more informal contact with the team (i.e. during lunch time) while performing direct observation of their activities. As a result we spent approximately 600 hours engaged in observation, training and conversation of various sorts. During this entire time field notes were kept in the researcher's diary (registered every day),

and artefacts such as improvement team's reports, learning reports, Toyota's pins, and Toyota Kaizen engineer's lessons were collected and analyzed. To supplement these records and the initial interviews, we examined a broad range of organization documents. For example, Standard Operating Procedures Manuals, Kaizen and 5'S guidelines, past minutes from Kaizen team's meetings and our own training material and worker's training material.

Data analysis

Our approach at this stage was to find out as much as we could about the organization, its members, and the routines they were engaged in. This is partly because our initial research objective was to focus in understanding process standards and routines in a process improvement practice. On a latter stage we added two additional objectives. Ones of them aims at understanding the relationship between the organizational and the individual dimensions that shape organizing process, not just standards and routines, also routines and non routines. The third objective focuses on understanding and exploring how these standards, routines, and non routines shape the competitive advantage of the firm.

Formal analysis involved three steps that took place constantly and over a period of some years. The first step was to write a manuscript that pulled together all the information we had gained about the organization in general, and the specific routines. This step was mainly based on the researcher's diary. In fact, the manuscript included all the detailed descriptions of Toyota assembly lines, production process, improvement or Kaizen activities, organizational culture, behaviours and attitudes of the foremen, team leaders and workers, and dispositions of individual as they pertained to the organizational routines we studied. It also contained detailed description of each of the routines, and about who has participated in them, what they have done, and how the routines were operated over the months of

observations. The second step was identifying key themes derived from the manuscript: understanding the relationship between standards, routines and non routines. Data was codified manually in the manuscript. Once the data has been collected and analyzed, we compared it with the literature on the subject (third step). We used the theory concepts to organize our observations of the routines. This exercise helped us to create a conceptual framework of our findings, which we represented in a metaphor (a ship and an anchor). This metaphor is useful for explaining our findings, since in qualitative research a good metaphor is very useful in structuring a complex phenomenon in a constructive way (Bonet, 2004).

Case study: Standardization without standardization? In Toyota Plant

Organizational Setting

Toyota Motor Corporation is one of the best automobiles companies in the world (Liker, 2004; Hino, 2006). Toyota Motor Corporation has fifteen plants in Japan, twelve of which are located in Toyota city (near Nagoya city in Aichi prefecture). In fact, our research case study factory is one of Toyota's plants that have achieved impressive results in productivity and efficiency. Therefore, this was one of the reasons to select this plant. Specifically, this Toyota plant covers a surface of 1,140,000 m², has approximately 4,904 employees and produces seven different car models, some of them just for Japanese market (Toyota Motor Corporation, 2007).

The Toyota Production System (TPS) represents the management heart of the factory. TPS is a production system that represents a viable method for making vehicles; it is also an effective tool for achieving the ultimate goal of a business – profit, while eliminating waste

(*Muda* Japanese word) every day (Monden, 1998). The operation of the plant is quite complex, consisting of a broad range of production, delivery and coordination processes that are performed by directors, engineers and workers. In general terms, Toyota plant production process is divided in five steps. The assembly line is step four. Steps one through three involves stamping the body panels from metal sheets, welding the panels together, and painting. The Cars arrive at the assembly plant as painted shells and leave it fully assembled, ready for the final step of checking and adjusting before shipment to dealers is made (five steps). We observed the complete production line and we therefore got the opportunity to see the TPS in action. Amongst other actions, we observed how workers eliminated, through process improvement activities, various kinds of muda of the production process.

Description of Routines

In the following paragraphs we describe the improvement activities (includes process improvement practice) that we observed in three of the routines, and some implications of these improvement activities. The first section (vignette) describes changes in the application of 5'S methodology and the second vignette describes the application of Quality Control (QC) Story – a methodology of problem solving. In all the cases the application of improvement activities that took place are much more complex that we could ever describe in an article. We just have portrayed the essence of the most significant elements of the routines. Each section varies in length because of the complexity of the improvement activities in the routines.

Vignette 1: 5'S — Foundation of improvement

Osada (1991) developed the original concept of 5'S in the early 1980s as a result of the work in Toyota Motor Company. 5'S is the acronym for five Japanese words *seiri, seiton, seiso,*

seiketsu, and shitsuke (Hirano, 1995). When translated, these words literally mean organisation, neatness, cleanliness, standardisation and discipline, respectively. Some authors claim that the 5'S represent the basic pillars of Lean thinking. In other words, implementing 5'S represents the starting point of any continuous improvement efforts (Ho & Cicmil, 1996; Imai, 1997; Liker, 2004), because the 5'S are the basic "blocks" to create improvements habits in employees (Suárez-Barraza & Ramis-Pujol, 2005). We focus on the first three stages of 5'S, which involved *Seiri (classification)*, *Seiton* (order) and *Seiso* (clean), because the other two stages are a consequence of the first three.

Seiri (classification) implementation is quite complicated due to some factors. The *Seiri* needs the awareness of the worker to recognize that the shopfloor needs to be clean and organized. In that sense, workers need to voluntarily recognize this situation. Workers are never forced to implement 5'S. In other words, the foreman or team leaders do not aggressively promote 5'S efforts. Therefore, in order to start *Seiri* they trust in the voluntary action of the workers. In addition, the implementation of *Seiri* is done by Kaizen teams who have to plan and organize their task, but they have also to make decision if they participate or not. One consequence of this process is that work place can accumulate *dirt*. Dirt in a work place includes unnecessary work-in-process (WIP) inventories; defective inventories; unnecessary jigs, tools and measures; "inferior oil"; and unneeded carts, equipment, tables, etc. In the plant's office, the unnecessary documents, reports and stationery are regarded as *dirt* as well. *Seiri* is thus the process of washing out all this dirt in order to be able to use the necessary materials at the necessary time in the appropriate quantity. Once the workers decided by their own that they will start the 5'S effort, they organize their Kaizen team. In practice, they make a meeting in order to reflect the decision, study the 5'S Manual (standard) and plan the first three stages. The 5'S Manual contains general guidelines to

implement the methodology, thus each Kaizen team can implement their 5'S effort according to their time and way of work.

The first step that needs to be done to start the *Seiri* stage is to establish a red label or card project. As a result the Kaizen team started to clearly separate necessary things from unnecessary ones. The instrument to do it is the red label. In other words, all the members of the Kaizen team determined the objects to be sealed (using red labels). Items that needed to be controlled and sealed usually included inventories, machinery, and space. Inventory includes material, WIP, parts, half-finished products and finished products. Machinery includes machines, facilities, carts, pallets, jigs, tools, cutting instruments, tables, chairs, dies, small vehicles and equipment, and space represents the floors, passages, shelves and storages. For the Toyota plant this kind of effort is considered a serious action and attracts top management's enthusiasm as an integral part of the improvement activity.

This first step provided good information about necessary or unnecessary items of the work floor, and the Kaizen teams established labelling criteria to select the elements (second step of Seiri stage). Although the 5'S Manual (standard) said that workers had to seal the unnecessary items with red label, it was sometimes difficult to determine which items were unnecessary. Therefore, the Kaizen team developed specific criteria according to their knowledge of the process. This action provided to the team a sharp line between the necessary items and the unnecessary ones. We expected to observe big red labels in all the assembly lines, but the red labels were small cards of 5" x 5" (actual size). The label itself represents another standard sheet, because each label contains the date, name of the checker, item classification, item name, quantity, process name and reason to be sealed. In addition, we observed that for the workers sometimes it was difficult to judge whether or not to seal

an item, however they did it. During the process of labelling the Kaizen team met at least once a week to reflect on how the 5'S process was being implemented. Besides, a member of the management staff (usually a foreman) did a verification of the labelling process. At this stage, the defects and dead stock (i.e. old models no longer used) were thrown out, whereas remaining items (excess inventories) were transferred to the red label storage. The leftover material (scraps) was examined for usability (yellow label); unusable leftover material was discarded, while the usable parts were placed in red label storage. After finishing the sealing process, the result was summarized in a list of unnecessary items. Each list (another standard) concluded with a recommendation for improvement action and/or countermeasure.

After the red labelling elimination process, only the necessary items are left. Therefore the Kaizen team entered the next stage of the 5'S: *Seiton,* or straighten. In the Seiton stage the Kaizen team organized their necessary elements in order to show where (position), and how much (quantity) material existed so it could be easily recognized. This step of the 5'S allowed workers to get a visual control of their own materials, because they easily identified and retrieved tools and materials and then readily returned them to a location near the point of use. At this stage they prepared and determined the location for every item that were used frequently and then placed they close to the workers who used them. Then after deciding on the space, the Kaizen team prepared the containers such as boxes, cabinets, shelves, palettes, etc, which were then labelled with place codes. The place code is the address of the item's location. Each item code and quantity was specified on the item itself via an *item code tag* and on the shelf where the item was placed via an *item code plate*. The application of these item code plates is similar to the system for assigning parking slots in a parking place. In this example, each car's number plate corresponds to the item code tag. Item code plats correspond to those placed at the head of each parking slot showing the owner's name and

plate number. Instead of using written number for these quantities the Kaizen teams expressed the quantities visually by drawing a conspicuous colour line at the proper position. In addition, in both stages of the 5'S the Kaizen teams applied simultaneously a specific cleaning (the third stage *Seiso*) in all work's cell (specific unit of work of the process line). Nevertheless, some of the workers expressed that *Seiton* stage took a lot of time, because the Kaizen team had to label all the places, shells, and plates.

Once one Kaizen team implemented 5'S something move around the plant. By this we mean that these new improvement activities started to be adopted by other Kaizen teams. We observed at least three processes during the six months of observations. In addition, each application of 5'S is an improvement cycle in each Kaizen team, because they have to continuously maintain order in the plant. In fact, according to 5'S Manual they have to do it at least once a year. In other words, *Seiri* (classification), *Seiton* (straighten) and *Seiso* (clean) were slowly converted into improvement habits. Almost every Kaizen team of the Toyota plant applied these stages by the end of the six months of our observation. This change went very smoothly, and all those who were involved supported it.

Vignette 2: Finding Muda in every process's standard every day

Standardization is at the heart of the production process in Toyota plant. The standard quantity of work-in-process is the minimum necessary quantity of work-in-process within production process (line); it consists principally of the work laid out and held between machines. It also includes the work attached to each machine. Without this quantity of work, the predetermined rhythmic operations (time of production) of various machines in this line cannot be achieved. The way that Toyota plant applies this mechanism of standardization of the work is the Standard Operation Procedure (SOP) (Hino, 2006). The SOP is a standard

work sheet that contains in general terms the following items: *Cycle time* (time of the process), *Operations routines* (steps to do the job charted in flow diagrams), *Standard quantity of work-in-process* (quantity of the materials to produce), etc. The standard operation sheet is a guideline for each worker to keep his standardized operations routine.

In order to follow the standards every worker has to accomplish one main objective in the Toyota Production System: the elimination of waste or *muda* (Ohno, 1978), so for Toyota plant to follow the standards meant not just to maintain the actual level, it is also meant to improve the status quo. A *Muda* for Toyota plant can be summarized in two main items: a) *Pure waste*: Unnecessary actions which should be eliminated immediately; i.e. waiting time, stacking of intermediate products, and reworking, and b) *Operations with no added valued*: Operations that are essentially wasteful but may be necessary under current operating procedures. A good example is walking long distances to pick up car's parts. In order to eliminate all possible Muda of the shopfloor (production process) the Toyota plant applied two main routines: established a quality circle (called Kaizen teams) and through this mean they implemented a problem solving methodology (called Quality Control Story). At Toyota plant every Kaizen team identified the optimal standards for each job. Moreover, these standards were subject to continuous improvement (Kaizen activities). Workers were encouraged to *Kaizen* their jobs and suggest improvements to the standardized work sheets. As we are going to explain in the next routine, before they started to Kaizen their jobs they were trained in Toyota plant's seven steps or Quality Control Story (Problem solving methodology).

Once the routines started the Kaizen team was prepared to implement a QC Story methodology. When one of the members of the Kaizen team called a problem or Muda to the

attention of the foreman (supervisor), the supervisor applied the QC Story methodology. During of our six months of observation, this process was applied at least three times by the Kaizen team shadowed. However, we could also observe in an indirect way how some other Kaizen teams did it. Find *muda* and to improve the routine by using QC Story is part of the daily activities for workers. As one member of the Kaizen teams expressed to us: *"In our plant the standards are not a hard rock, you know, we always have the possibility to improve. For me, it is the only way to learn (I-5-1995)"*.

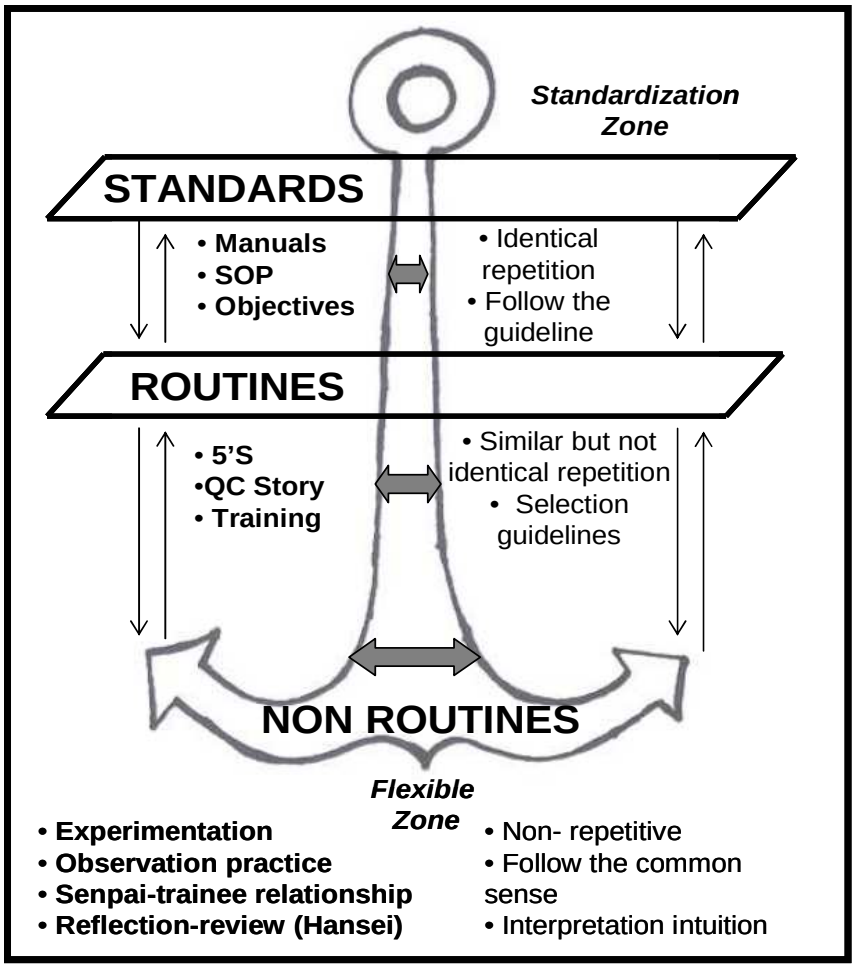
One additional step in this routine came to our attention after the implementation of each QC story cycle, when we learned that the foreman could also integrate a *Pilot Project team*. The first outreach was that the pilot project team had a main purpose. The pilot project team at Toyota plant became a permanent unit with rotating membership. Its role and size changed depending on the type of muda. Workers joined the team for months at a time, usually returning to the shop floor when the problem of the process was redesigned. We observed that this pilot project team consisted of eight members; four of them had worked were *senpais (*Japanese word related with the term Senior), while the others had only been in the factory between two and three years (juniors). According to our observations, the pilot project team could be a vehicle in which senpais systematically and deliberately shared with junior colleagues their knowledge, skills, problem-solving capabilities, and attitudes necessary for the job. It was an opportunity to make experimentation in the entire production process at the plant. Actually, we observed that at the beginning of the implementation of the routine, each *senpai* held preliminary discussions with the juniors to encourage learning. In fact, in the redesigned process, they trained juniors by first demonstrating and then observing the trainees performing the task. Besides, during the process senpais commonly asked 5 times "why" to the trainees. This specific technique helped and revealed the essential causes

of the problems by forcing the observer to look beyond what was visible. These kinds of actions within the routine were not written in QC Story Manuals. In other words, there were no instructions. Once the process was already improved or redesigned and the training also completed, every senpai assessed what has been learned.

Findings and Discussion

In this section we present and discuss a conceptual framework using a metaphor at two levels (micro and macro theory): A ship and an Anchor (See figure 1 and 2). Then we discuss how understanding standards, routines and non-routines could be an important mechanism for process institutionalization and organizational improvement and learning.

As we described in the case study, Toyota Plant has several types of processes with their own purpose and logic. Attempts to improve quality of production process in a continuous way may start from identifying repetitive activities and task and standardizing them as far as possible. At the other extreme, we found within this standardization zone, some practice that were thriving in routines and non routines environments (flexible zone). This kind of continuum relationship can be illustrated in a ***micro level analysis*** with a metaphor of an Anchor as in figure 1 in a micro theory analysis



Source: Own.

Figure 1: Metaphor of an anchor: a micro theory analysis of standards, routines and non routines in process improvement

This metaphor provides us a way to explore and represent the nature of continuous process improvement in Toyota plant shop floor. We chose an anchor because this instrument is a good representation of security in a turbulent external environment (brave sea). An anchor is made out of three components, an upper part or slime's iron stick; a bottom and wide part (the arms of the anchor); and a middle part that represent a connector between these. The slime's iron stick provides rigidity and stabilization for the ship and on the other hand, the arms of the anchor provide flexibility. In fact, the arms of the anchor have the capacity to hold in a strong way at the bottom of the sea, and when this situation happens, the form of

the arm of the anchor gives to this object the capacity of rigidity and flexibility at the same time (sailing with the anchor in the middle).

If we apply this metaphor (see figure 1) to Toyota Plant, the upper part of the Anchor represents the *Standards*. Thus, as we described in the case, for Standards we mean all the activities of the production process that are repetitive and can be standardized. These activities comprise inputs, conditions and similar events, and outcomes that are known with reasonable certainty. In fact, when Toyota plant applies standardization, it does it through SOPs. As we described in the case, the SOP is the way that the plant achieves work balance among all production processes in terms of performed activities and time. According to our observations standards in Toyota plant are semi-rigid, since we observed that workers followed the SOP because this mechanism provided them with a routine or sequence of operations that the workers performed during the process cycle time. Therefore, the SOP is a guideline, and we found different examples at the plant.

Following the iron stick of the anchor (top down approach), its middle part, the connector between the slime's iron stick and the arm represents the *routines*. This middle part is the place where rigidity and flexibility are brought together. As we move along the anchor from the top to the bottom, standardized and manageable operations start to become increasingly mixed with vague and unknown features that cannot be explicitly described in a manual. For instance, a 5'S or QC Story Manual (Standards) is just a brief guideline for implementing improvement activities. These manuals are just guidelines and foremen and teams leaders select their own way to implement them. As we observed in some cases, workers who mostly dealt with standards and routines, may occasionally observe and bring forth *mudas* or problems that otherwise would have been lost.

Finally, at the bottom of the anchor (the arms) we represent *non-routine* mechanism with a variety of flexible movements. We observed at least two different mechanisms that we consider non-routines. First of all, we found different routines that need some non-routine that we called: *experimentation*. At Toyota plant, the focus is on many quick, simple experiments rather than on a few lengthy procedures (i.e. *Pilot Project team, or Kaizen team applied QC story*). Junior workers learn from making small incremental improvements rather than large system-design chances. Every senpai taught to junior workers how to perform the job, and then, the latter looked for drawbacks in the process, then they tested their understanding by implementing a countermeasure, thereby accelerating the rate at which they discovered "contingencies", "waste-muda", "problems" or "interferences" in the process. This was precisely the workers' practice of process improvement, using non-routines to teach. They could not "practice" making a change, because a change can be made only once, but they could practice the process of observing and testing many times.

Secondly we identified *observation practice* as another non-routine, which was very similar to the previous one. As we observed, before any worker tried to improve a process by experimenting, they had to observe the situation to try to fully understand the waste and the solution before they start. Observation practices were also taught by senpais and team leaders, and it was an essential part of the experimentation non-routine. There were not a Manual or Standards to do it; it was a natural practice tough to workers within the Kaizen culture. Finally, senpais and team leaders always encouraged workers to observe and to make reflection-review (Hansei, in Japanese). They always put in difficult experiences without explicitly stating what or how they were supposed to learn. For instance, when observing Kaizen or pilot project teams, senpais or team leaders showed workers how to observe and to spot drawbacks, wasted effort, mudas in the process, wasted movements, and

so on, and they explicitly advised junior workers on how to apply improvement efforts. They became coaches instead of instructors, with a strong relationship. In fact, you would never find in any manual how to establish this relationship or when every worker has to stop to make a reflection-review.

On the other hand, in a *macro theory analysis* we can argue that every ship (organization) has an anchor. The anchor gives to the ship stability and rigidity (standards). When we have a brave sea, the ship has the capacity to lift the anchor, and sail with the anchor in the middle between the surface and the bottom of the sea (routines). The resulting wide space in the middle represents the non-routines, which concedes to any boat the ability to be strong and rigid and sail with flexibility at the same time in turbulent sea. We illustrated that in the figure 2 below.

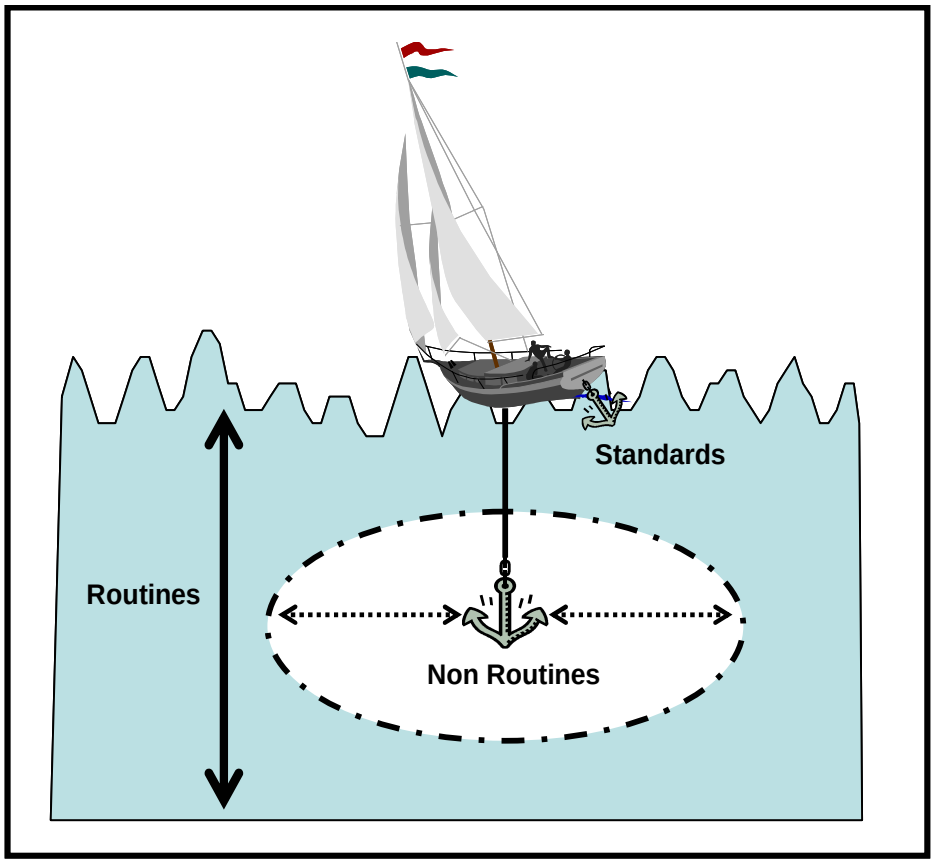


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Figure 2: Metaphor of ship and an anchor: a macro theory analysis of standards, routines and non routines in process improvement

Conclusions

Our case study has revealed that an organization can combine standardization without standardization, which means to remain focused in efficiency during the process improvement approach (standardization zone) while leaving a flexible zone (routines and non-routines) at the same time. Using a metaphor (micro and macro) we could structure a discussion about which tasks and processes should be standardized, which should be guided by roughly defined routines, and which should be supported by non-routines. Besides, the relationships between these three components gave Toyota plant a viable and strong competitive advantage in its industrial sector. Therefore, it seems that this framework could represent a first answer to how Toyota Corporation improves and remains stable at the same time.

Finally, we also confirmed Feldmand's (2003) conclusions about routines, in that they are not inert elements, but that they have the potential for change in the internal dynamics of the routines itself, and of course in the actions and thoughts of the workers who participate in the routines. Routines changes were achieved in Toyota plant by making people capable of and responsible for doing and improving their own production process, by establishing connections between junior workers and senior workers (senpais), by making experimentation and reflection-review processes, and by pushing the resolution of connection and flow problems or *muda* (waste) to the lowest possible level: *Standardization without Standardization?* Looking for the answer to the questions raised at the introduction of this paper, the proposed metaphor (macro and micro theory) could be a guide to practitioners who desire to standardize and improve their operational processes in a turbulent business environment. Future research should aim at extending our findings in order to confirm and reject our metaphor (micro and macro theory). Perhaps, more in depth studies in other Toyota plants in a different context may be the first step.

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