# Lean or Sigma?

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## INDUSTRIAL MODELS

Throughout industrial history, a few firms have defined the industrial models of their times. Modern manufacturing starts with Adam Smith's "pin factory" and the division of labour in the eighteenth century, which Frederick Taylor perfected as "scientific management" at Bethlehem Steel in the nineteenth century. In the past hundred years, taylorist productivity methods progressed to an entirely other level through Henry Ford's development of "mass production". Since then, Taichi Ohno reinvented the model at the Toyota Motor Company to deal with many of its wastes and move it away from the "black Ford T" to encompass variety as well as standardization.

Industrial models are often synthesized in a single catchy phrase such as "one best way", "production line" or "Just-in-time", but these quick description typically misrepresent the truly profound changes implied in each new model. Taylor's insight, for instance, was that by observing how the most effective workers went about their job, work could be standardized and applied to all. To be able to do so, he instituted engineers and clerks to realize the time-and-motion studies, piece-rate pay to identify the most effective workers, special equipment provided by the company as opposed to workers owning their own tools, and so on. The ultimate consequence of Taylor's method was to introduce into basic line organization much of the functional complexity we deal with now.

Similarly, Ford didn't just invent the production line. He pushed Taylorism to an extreme by first standardizing parts (to avoid fitting), dividing labour into smaller and smaller units, but also paying workers the $5 wage, integrating vertically, and so on. In the same vein, Just-in-time at Toyota is not simply a matter of kanban cards, but an entire organizational perspective involving bringing the supermarket in the

factory, continuous improvement through Kaizen, total quality with SPC, autonomous teams, rethinking equipment for "autonomation" and so on. With hindsight, there is a clear continuity from the "pin factory" division-of-labour model to Toyota's "lean" approach, as each new step solves some of the problematic side-effects of the previous incarnation and deals with the increasing complexity of global competition.

## COMPETITIVE PRESSURE

As their success becomes recognized in their industries, such models tend to spread through sheer competitive pressure. Companies who adopt the new model early gain sustainable advantage, those who don't face an uphill struggle and eventually disappear. This does not mean, however, that adoption is either rapid or easy. In every case, the new model is fought hard by both workers and management. In Taylor's case, owners were adamant not to pay the suggested increase wage to workers nor to invest in the necessary structure to make taylorism work. Ford's mass production model was portrayed as the end of artisanship in the automotive industry (rightly enough) and ridiculed by Chaplin in *Modern Times*. The Toyota model has long been dismissed out of hand as a cultural artefact by established industrial firms.

Yet, as the success of those who adopt the new model become apparent, firms are eventually compelled to comply or disband – a struggle in which many try but few succeed. In the British car industry, at the turn of the XXth century, researchers counted no less than 130 companies in Coventry alone. By the end of the 1930s, there were only 20 independent car manufacturers left in the UK[1]. Adopting a new model is rarely easy since it usually means a complete change of outlook although not necessarily a radical change of organization. Furthermore, true experts are rare although self-proclaimed gurus are many and as a result, reliable knowledge is not always readily available. Finally, one should never underestimate straightforward resistance to change, or, in many cases, management's resistance to understanding.

In the end, the new model becomes firmly established through selective pressure as the companies having bridged the gap drive all other competitors out of the

[1] http://news.bbc.co.uk/1/hi/business/551543.stm

mainstream market. Nonetheless, even in today's fast-paced, change-driven society, the acceptance of new industrial models can be counted in decades rather than years – it doesn't happen easily. Is it that only a few firms are capable of confronting such changes? Not necessarily; change and continuous improvement are by and large accepted as necessary to modern business survival and most companies are heavily engaged in change programs – but these initiatives don't always help them to acquire new industrial models.

## IMPROVEMENT PROGRAMS

In practice, knowledge of new industrial models doesn't reach executives in one fully packaged format, complete with detailed explanations and "fieldbook". As a firm starts to be recognized for its exceptional performance, observers identify single aspects of a new model and make their business to convince others to adopt such "best practices". Bearing in mind that it is hard to grasp new vistas with old lenses, it is hardly surprising that the first initiatives driven from early reports of the new model are not particularly successful. The first inkling the West had of the lean model, for instance, was through "quality circles". These became the rage for a few years, but soon led to disappointment and discredit – in the United States, 75% of the Quality Circles initiatives started in 1982 had been abandoned by 1986[2]. With 20/20 hindsight it appears fairly obvious that attempting to graft quality circles in traditional western manufactures was bound to fail.

Still, knowledge arrives in small packets: kanban, then SPC, TPM, SMED, etc. Every time, the consultants who make a living out of such things tend to explain that their sliver is *the* necessary piece of knowledge which will resolve *all* the problems of the enterprise. Total Productive Maintenance, for instance, became in several instances "Total Productive Management" and the TPM approach was then applied to the company as a whole. Not necessarily a bad thing, but not likely to deliver great results either. After the spotlight moved away from Total Quality Management (the extension of SPC to the entire company), it eventually reinvented itself in "Six Sigma" and some companies currently claim to be "Six Sigma Companies".

[2] PASCALE, R. T., (1990) *Managing On The Edge*, New York: Simon & Schuster

Such programs have increasingly become tools of corporate management. Over the past two decades, with increased competition in winner-takes-all global market the recognition of a corporate need for constant renewal and improvement has emerged, hence change programs. In the second half of his tenure, Jack Welch initiated no less than four widespread initiatives: work-out, boundaryless organization, six sigma and finally destroyyourbusiness.com. These are not small endeavours. According to Welch, in 1996, the first year of Six Sigma for instance, GE spent about $200 million in training 30,000 employees – and got somewhere in the neighbourhood of $150 million in savings[3]. Most of these gains appeared in service areas, processes previously untouched by optimisation – results in manufacturing are far less obvious.

As star companies, always the focus of media attention, invest in such programs, the business world as a whole embraces new concepts much like fads and fashion capture the public at large. From 1950 to 1988, Richard Pascale counted more than thirty management fads – and this before the explosion of the nineties with Re-engineering, Empowerment, TQM, or 6 Sigma. Reengineering, for example, is a good point in case. The concept of re-engineering companies on a core-process basis emerged from three realizations. Firstly, the lean concept of lead-time as a key driver to market dominance emerged in the early nineties as one of the key lessons from the Japanese industrial offensive of the eighties, as did the notion of continuous improvement as a source of sustained competitive advantage. Management consultants Hammer and Champy saw an opportunity to leverage radical improvement in lead-time by applying information technology to business processes and thus overcome organizational "functional barriers"[4]. More than ten years down the road it is still hard to assess the effectiveness of the various reengineering efforts of the early nineties, but clearly the re-engineering movement took the business world by storm, gathering speed in the nineties with a peak around 1994, then moving on to public services and finally disappearing as a hot topic about 1997[5]: when all the hype moved on to Six Sigma on the one hand and the "new economy" on the other. Evidence for this cycle can be backed up with citation analysis in newspapers, articles or journals which shows a slow growth from1990 to 1992, a

[3] WELCH, J. & J. A. BYRNE (2001) *Jack, straight from the gut*, New York : Warner Books
[4] HAMMER, M. & J. CHAMPY (1993) *Reengineering the Corporation*, London : Nicholas Brealey
[5] HOLTHAM, C. (1994) « Business Process Reengineering : contrasting what it is with what it is not », in C. COULSON-THOMAS (ed.) *Business Process Re-engineering : myth and reality*, London : Kogan Page

sharp upturn in 1993 peaking in 1994/1995 and a steep plunge in 1996 (with a significant lag in public sector articles)[6]. Reengineering is a clear case of taking one idea – process focus – and applying it across the board to organizations as a matter of ideology as much as anything else.

This is not to say that such managerial fashions don't have an overall impact on industry. Indeed, as sociologist Robert K. Merton pointed out, the ways in which people define situations have real effects[7]. The re-engineering movement certainly transformed how managers think about processes, much as TQM and Six Sigma have placed fact-based and statistical approaches to the forefront. Yet, most of these fashions pass to be replaced by the next best thing because, at company level, the results of such programs are consistently disappointing. Beyond the much publicized case of a few large corporate programs very few real cases of successes can be found, and overall the economic effectiveness of these various programs is hard to prove. Consequently, driven by the need to "do something" (and often be seen by Wall Street in doing something) senior executives will abandon the current floundering program for the next best thing.

## THE PATH OF LESS RESISTANCE

Industrial models, on the other hand, remain relevant throughout the years. Adam Smith's analysis of the pin factory is just as insightful in the XXIst century as it was in 1776. Taylor's "one best way" is a key to understanding "standardized work", just as Ford's process outlook and economies of scale are still a key component of industrial success. What each new model does, however, is not "fix" problems, but revolutionize manager's total perspective on industrial performance without adopting the simplistic, one-dimensional outlook of most change programs. Consequently, models have far longer lifetime and more profound impacts. The few companies that seriously adopted lean wholesale as opposed to piecemeal are thriving. Indeed, Toyota, lean's inventor, is doing better than ever, benefiting from hard times when its mass-production-with-added-bells-and-whistles competitors are suffering badly.

[6] JONES, M. & R. THWAITES (2000) « Dedicated followers of Fashion : BPR and the Public Sector », in D. KNIGHTS & H. WILLMOTT (eds.) *The Reengineering Revolution*, London : Sage
[7] MERTON, R. K. (1995) « The Thomas Theorem and the Matthew Effect », *Social Forces*, 74(2): 379-424

Ultimately, to compete, all companies will have to adopt lean principles simply because it is currently the only know way to resolve a fundamental industrial conundrum. As George Stalk phrased it, industrial cost goes down by about 15% to 25% per unit every time volume doubles, but goes up by 20% to 35% when variety doubles[8]. At the moment, lean is the only proved way to increase variety and reduce development-to-market time while maintaining low costs and premium quality. Why aren't more companies adopting lean wholesale rather than squander time and effort on change programs? As any new model, lean has the same short-term advantages as any other change program: it produces quick-wins, can be implemented on the shop floor without having to change the entire structure and has the added benefit of providing a roadmap to progress well beyond gathering the initial "low-hanging fruits". Why should companies waste time with Six Sigma (or whatever will come next) when they could be investing in lean in the first place - and since they'll have to do so eventually?

The constant influx of change programs shows that modern firms can no longer be blamed for "resistance to change". Indeed, they now seem to be addicted to change and only slowly coming to terms with the fact that few changes are actually improvements. The problem with adopting a new industrial model as opposed to a change initiative is far less a practical one than a "resistance to understanding". New models fundamentally challenge management's perspective on not just specific practices, but their very instincts and reasoning about how to run their business. Changing one's mindset remains one of the greater psychological challenges, and indeed both companies and entire societies have repeatedly shown that they're ready to die rather than shift their outlook.

Contrarily to popular belief, changing practices is far easier than changing perspectives – which is why programs are so popular. By now, most mass production companies have accepted and adopted many lean aspects while retaining their core beliefs in how business works. Consequently, they're not obtaining the hoped for breakthrough although they invest in one change initiative after another. Models are fundamentally different from programs in terms of:

[8] STALK, G. JR. (1991) 'time- the next source of competitive advantage', *the state of strategy*, Boston: Harvard Business Review Press

- *Outlook*: Ohno's initial insight of bringing the supermarket in the factory and enhancing response time through short batches, levelling, just-in-time and continuous improvement is not just a toolbox to improve the way one currently runs the shop, it's a fundamentally different take on where the industrial economies of scale can be found and how to succeed on competitive markets.

- *System*: consequently, a model is not simply an assortment of techniques – it's a system. Used independently of one another, the tools will produce local benefits, much like Sigma or other projects will, but that's also as far as it goes. Used as a system however, lean tools can progressively transform operations and lead the firm from the old model to the new.

- *Roadmaps*: program tools tend to be fairly one-dimensional. Six Sigma tools, for instance, will help teams to resolve specific issues but will rarely lead them to challenge the fundamental ways they operate and once one project is concluded, it hardly tells them where to focus next. On the other hand, the lean model has a roadmap to transformation which follows a step-by-step approach from early quick-wins to more fundamental transformations.

Adopting a new model rather than a change program is not any more difficult on the shop floor, or longer to show results, but it is harder in unexpected ways: it demands from senior management both a considerable intellectual investment and constancy of purpose. As one of the key developers of lean, Shigeo Shingo, points out:

"*In order to successfully implement the Toyota production system* [lean], *you must have a correct understanding of the basic ideas behind these principles and the knowledge of methods and techniques to be able to implement them in a systematic way; otherwise, I fear you are likely to make serious mistakes which will result in the failure of the system – even if you have a clear understanding of individual techniques*"[9]

One of the most robust psychological findings of the past century is "cognitive dissonance": we cling to our outlook and tend to dismiss or explain away dissenting evidence. Changing one's perspective doesn't come naturally and requires the time and effort to understand what the new model is really about, beyond the obvious "best practices". In many unfortunate cases, lean techniques have been modified to fit the existing perspective of the factory, leading to bizarre consequences. Secondly, constancy of purpose is essential because old habits die hard and instincts are difficult to change. As managers implement the new model, they need to question

[9] SHINGO, S. (1981) *A Study of the Toyota Production System*, Cambridge : Productivity press

every new situation in this light not to fall unawares in the old ways of thinking and follow the path of least resistance back to square one.

All in all, adopting a new model requires ambition for the company as well as for oneself. To many executives, change programs are an attractive alternative: they produce quick, easily quantifiable results and don't challenge the core thinking of the firm's line hierarchy. Change programs are also easy to explain and communicate. They are a great vehicle to get people enthused and on board. Unfortunately, change programs do not deliver in the long run. Astonishingly, after endless initiatives and change drives, the big three automakers are no nearer to becoming lean and Toyota continues to steadily gain market share.

| | SHORT TERM | LONG-TERM |
|---|---|---|
| BENEFITS | **Model:** productivity and quality shop floor quick wins and opening the minds of management and workers<br><br>**Program:** quantifiable quick wins in individual or team projects which can be done "on the side" | **Model:** change of perspective which leads to a transformation of how business is done and is a fundamental source of competitive advantage. Also increased barriers to competitors since the new model is harder to acquire<br><br>**Program:** few long-term benefits which leads to the abandonment of this program and its replacement by the next best thing |
| BARRIERS | **Model:** resistance to understanding – as long as management has not acquired the new outlook the performance of the tools is disappointing<br><br>**Program:** other than the cash outlay to get things started, there are few barriers to implementing a change program beyond the cynicism of experienced employees | **Model:** requires intellectual investment and constancy of purpose from senior management. To succeed in changing the firm's model, top management has to get involved in more than giving a distant blessing and signing the check<br><br>**Program:** no synergy from the various spot actions which leads to disappointing results, weariness and ultimately disregard fro the program |

**A VISION OF EXCELLENCE**

At the end of the day, although a lean plant is easily recognizable, no one has ever seen a "Six Sigma" plant – nor an "empowered" plant, or yet again a "re-engineered" supply chain and so on. Fundamentally, industrial models sponsor clear visions of excellence in the real world of value-production. Such visions are the driving force behind the implementation results of each new model. On the other side, most programs tackle the side-effects of the existing industrial model, rarely proposing a new, practical, vision. The difference is essential to the continuing progress of the plant. As one implements lean, the factory gets transformed in practice and new opportunities for further progress appear. For instance, a "5S" exercise will clean up the shop floor and uncontrolled inventories will become obvious (as many other things such as product defectives, poorly maintained tools etc.). A machine with a stock of parts behind it is a sign of either machine reliability issues or poor quality of produced parts. At the next level, for instance, setting up a shop stock and a kanban production trigger will render visual the variations in production. For example, a line with a full shop stock (overflowing somewhere else in the plant maybe?) and an empty kanban queue is a sure sign of overlong production runs, and so forth. As the new model is implemented, the reality of the vision of excellence is uncovered in the factory – and guides managers in their improvement efforts. For all their worth, programs can't go any further than a sequence of solved unrelated problems.

Programs are only considered as serious alternatives to models as a result of short-term biases, in the same way that business constantly suffers the bandwagon effects of fads and fashions which lead to inevitable bubbles and the following panics. At a given point in time, both executives and business media tend to focus on well publicised, simple business strategies which make sense at a given point in time but unfailingly turn out to be flawed (think about the "new economy" and its disdainful disregard for earnings until 2001). Programs are easy sells, both to management, employees and investors. A new model such as lean, on the other hand, has been around for decades, has many validated success stories on the long-run, not just a few high-profile showcases, but is far less immediately attractive to the management fashion industry. Ironically, most industrial programs originate in the lean model: quality circles, SPC, just-in-time, total productive maintenance, continuous improvement, autonomous teams and supply chain management. But, much like pacific islanders which proudly wore western hats with their traditional costume, rather than acquire the discipline of the entire suits, companies find it easier to pick

on some aspect or other, only to be disappointed with their performance when it appears that new hat notwithstanding the king is still naked.

In the long run, the choice between implementing a model or a program, lean or Six Sigma does not so much reflect on the effectiveness of the tools and techniques, but on the management flair of the executive team. Senior managers are, as they should be, ambitious – but are they ambitious for themselves of for their company? Pushing one program after the other is much like picking stocks because others on the market are buying them: although the strategy has been proved to be flawed time and time again and leads to bubbles and the subsequent crashes, many fund managers still do so. Investing in transforming one's operations by implementing a new business model is like purchasing stocks of companies after careful research and full confidence that the price of the stock reflects the value-production future of the company. Although all investors know this is how they should proceed, not many can be bothered; the few who do so consistently prosper beyond any expectation.