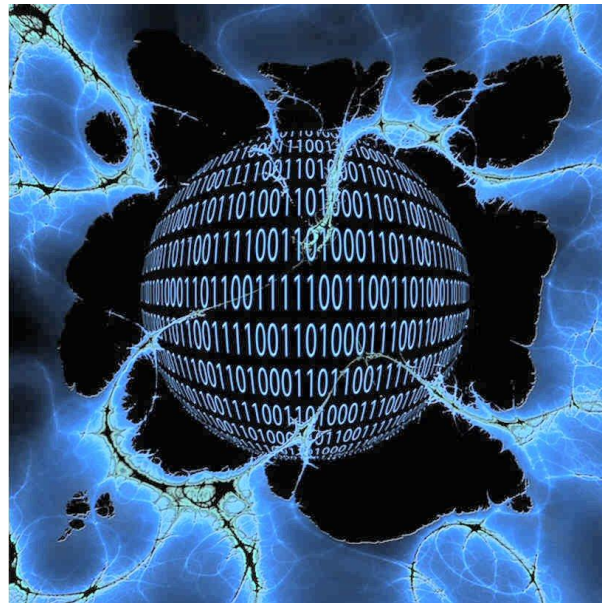


# CONTROLLED DESIGN MANAGEMENT

by Moises J Goldman PhD and John Jonelis



## **Abstract**

*Today's business culture is more strongly creative and entrepreneurial than at any time in history, posing new organizational opportunities and challenges. That calls for a new way to think about and implement design management. Using the language of the digital age, this article introduces a new perspective, applying a radically different technique to the management of the creative process, and then demonstrates an intuitive working model that functions in any modern organization.*

## Current Management Models

Management models have undergone disruptive changes over the years. The early 1980s was a time when Japanese productivity achieved the highest level anywhere in the world. At that time, productivity had fallen in the USA, and many felt that America could and should learn from Japan. There was a real call to break from the Traditional Model of product management.



Curiously, the Japanese renaissance was, in large part, the product of an American—the pioneer W. Edwards Deming. He espoused high product quality coupled with a humane approach to managing people. He laid out a complex set of principles to realize those ideals. Deming built his approach on different assumptions than the Traditional Model. I had the pleasure of working at a company founded on his principles. This was rare in the USA, but the Japanese implemented his theories with fervor. Much can be said about the details, but when you boil it down to its simplest terms, Japanese success was actually based on three broad factors:

- **A focus on a strong corporate structure**
- **Long-range staff development**
- **Consensus decision-making**

These factors led to lower turnover, higher job commitment, and higher productivity. This initiative was then adapted for use in the USA by William Ouchi and became known as Theory Z.<sup>1</sup> For a time, Eli Lilly, Rockwell International, General Motors, Westinghouse and many other large corporations embraced this new dogma.

But this new paradigm clashed with the ideas of western management and the expectations of an American workforce. Theory Z didn't gain lasting traction in America, where the Traditional Model continued to dominate. Why the cultural clash? It has to do with the way we think—more particularly, the way in which we picture or imagine a process. Figure 1 lays out the Traditional Model of product management in graphical form:

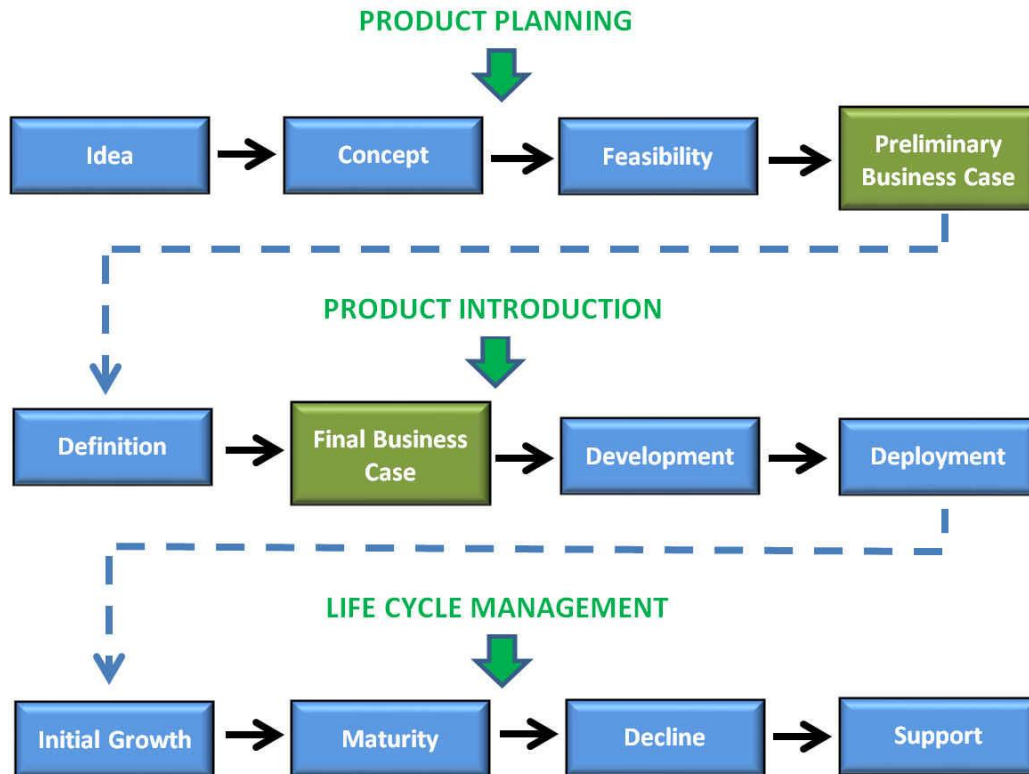


Figure 1 – Traditional Product Management Model

The Traditional Model can be expressed as a high-level sequence and it is, quite simply, one specific mode of thought. To its credit, it does an excellent job of defining a product life cycle. Everything is placed neatly in a row. There is a defined beginning and end. But the weakness of this model slows many organizations that use it and it does nothing to improve or optimize a process. The inherent top-down mode of thought is a limiting factor, and is also limiting to the models that grew out of it or rose up in reaction to it.

## New Paradigms

Nowhere was the contrast with Japan greater than in automobile manufacture. Japan, long known for its cheap, low-quality vehicles and other junk, began to crank out the best-made cars, electronics, and other products in the world. Meanwhile, Detroit remained mired in the concept of planned obsolescence. Consumers took notice and they voted with their wallets.

Then Toyota rolled out *Just-in-Time Manufacturing* (JIT) as a way of reducing the cost of inventory. Among other changes, JIT heightened the awareness of design management itself. Eventually America had to adjust if it was to compete with the Japanese, and the resulting chaos

changed the way we do business today. Companies began to adopt JIT, and increasingly moved toward a new ideal—the *Hollow Corporation*—also known as the *Virtual Business*.<sup>6</sup>

At its extreme, the Hollow Corporation is an organization stripped of almost every function. Brand means everything and the company makes nothing. Everything is measured in money, and profit is the only goal. A simple example of a hollow corporation is an American clothing designer taking on a European-sounding name and making designer clothing in China for sale to the world. As this trend grew, companies outsourced more and more functions. This intensified the importance of brand marketing and marketing for globalization. While this was going on, America was busy transforming itself into a service economy.



## Globalization Matures

But industry discovered that it was not only possible but also cheaper to manufacture products overseas and ship them back to US shores. Whole industries moved their factories offshore—especially to China. The entire textile industry left. Tool and dye left. Electronics manufacture left. With time, others followed, including crucial smokestack industries such as steel.

The next logical step was to offshore project management and product development. Creative and physical design had always been a key competitive advantage in the USA. Its business world smugly expected it to remain so. But due to the ability to collaborate across the internet, actual design began to take place at multiple locations across the globe, with products for sale to the world—and with great success.

These trends were not without intriguing and sometimes counterintuitive aspects. Businesses made adjustments.

- Many US electric generation utilities sold off their physical power plants in search of greater profits as distribution networks.
- Fluctuation in the currency market led Japanese automobile manufacturers set up production facilities in the USA, closer to the end consumer and using American workers—and still, American manufacturers struggled to compete with them.
- US automobile manufacturers and other industries abandoned the policy of planned obsolescence and over time learned the new culture of quality.
- South Korea began to design and manufacture high-quality goods—from pianos to automobiles to mobile phones.
- China began outsourcing to the Vietnam and other third world countries in search of even cheaper labor.



## Lean

In the early 2000s, after the internet bubble burst, it became abundantly clear that the US needed a new competitive edge. A product management philosophy took hold, called Lean—Lean Development, Lean Manufacturing, Lean Planning, Lean Sigma, Lean Start-up.<sup>2</sup> Lean is a management philosophy that considers any part of the enterprise, which does not directly add value to the final objective, as superfluous—be it product development, customer service, or for that matter, the entire enterprise. It examines all processes and eliminates the ones that do not add value to the end objective. Lean is an attempted departure from the traditional way of doing business. It found favor in the US and, to one extent or another, became a dominant model.

In Lean Management, a project is broken into two phases. Phase 1 – *Stealth Mode* – represents the alpha version of a product. The nascent prototype is tested in the internal company environment. Further development leads to a beta version for which certain companies, by invitation, test the product before release to manufacturing. Phase 2 – *Market Mode* – represents the completion, approval, and release of an MVP—*minimum viable product*—which then goes through a correction phase that includes bug fixing. At the same time, a company will test

features. This includes, by implication, changes to marketing plans, sales strategies, etc. (See Figure 2.)

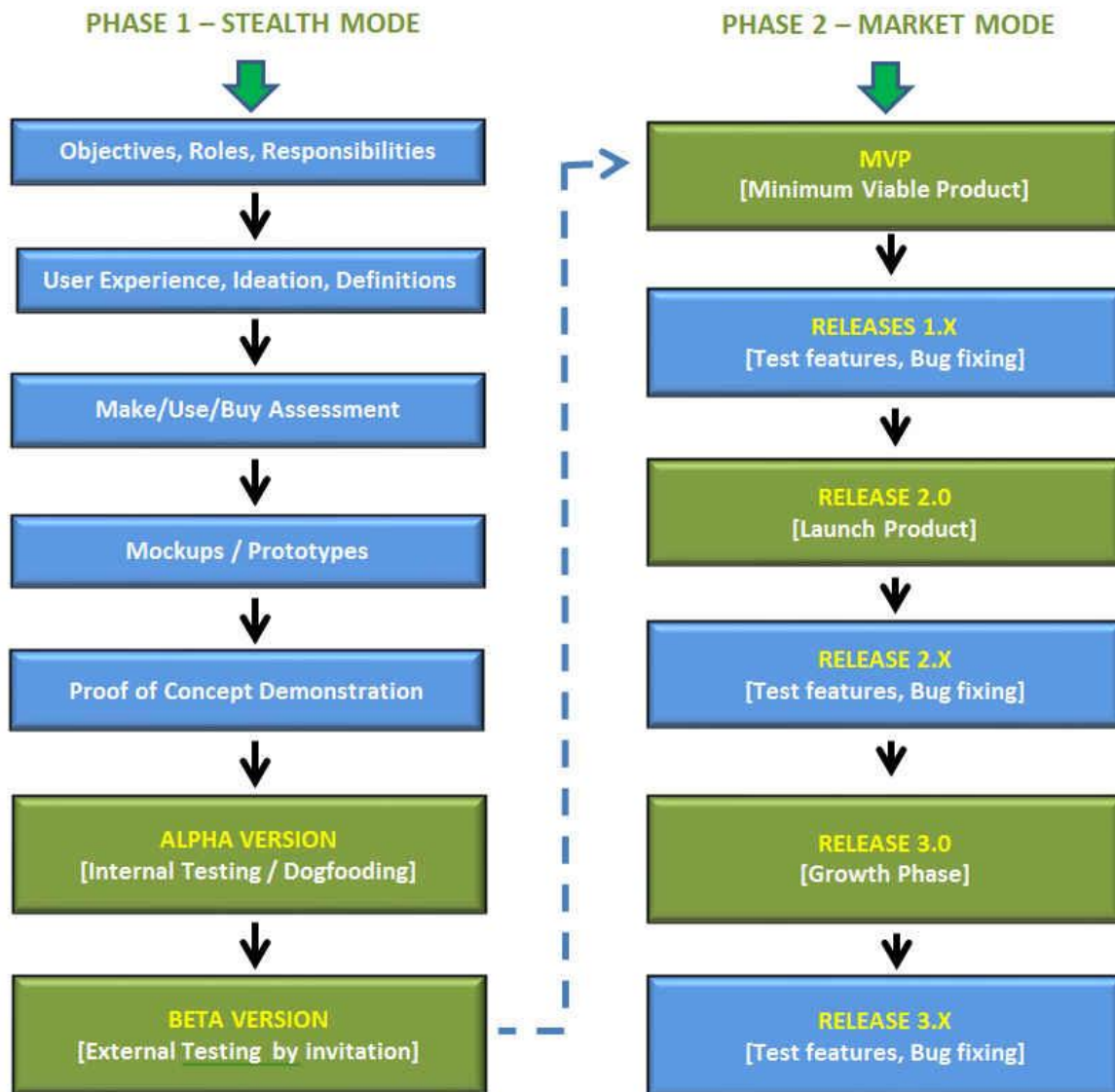


Figure 2 – Lean Development Mode

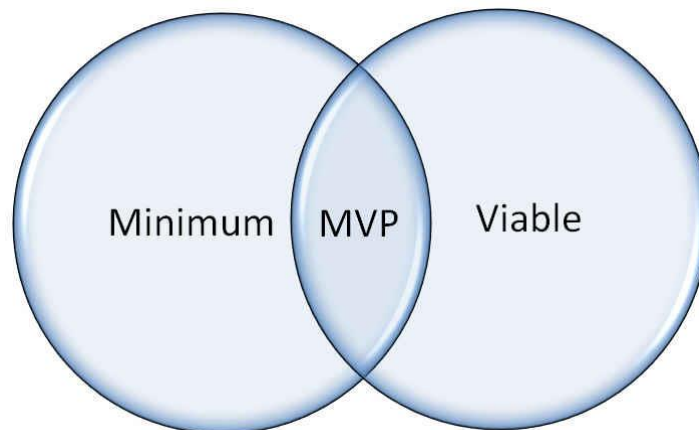
The Lean Model does a superb job of describing the modern way of thinking about the product cycle, but the same thinking that governs the Traditional Model drives it. As before, it finds expression as a high-level sequence. It provides a manager no road map to improve a situation, and instead depends entirely on personal talent and resourcefulness to win the day.

## Traditional vs. Lean

Lean presents certain points of emphasis that distinguish it, such as the MVP, but the irony is that when we compare the Lean Model to the Traditional Model, we find that they are basically the same.

- “*Idea, Concept and Feasibility*” in the Traditional Model are no different from “*Objectives, Ideation, Definitions, and Mockups*” in the Lean Model.
- “*Preliminary Business Case, Definition, and Final Business Case*” in the Traditional Model are not any different from “*Proof of Concept and Alpha Version*” in the Lean Model.
- “*Development*” and “*Deployment*” in the Traditional Model is the same as the “*MVP and Releases 1.X*” in the Lean Model.
- “*Initial Growth*” in the Traditional Model is the same as “*Release 2.0 and Releases 2.X*” in the Lean Model.
- “*Maturity*” in the Traditional Model is no different from “*Release 3.0 and Releases 3.X*” in the Lean Model.

Obviously we could point out more similarities and the reader may ask what we have gained out of the so call Lean Model. The answer is actually quite profound: *A significantly different perspective on the same thing.*

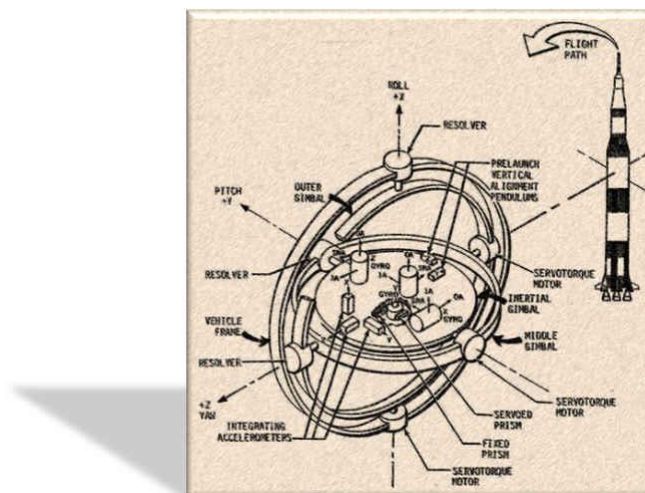


New management models may induce radical change in various ways, but companies will always consist of people, their ideas, and a structure. A commercial concern can be described as the organized creation and distribution of products and services. That probably will not change. So we are dealing with the same basic material, but the point of view and emphasis makes the difference between one model and the next. The change in perspective can be highly valuable and the ramifications extreme. Compare for a moment some of what has already been discussed: Japan’s renaissance in the 1980s, JIT, Lean, and the Hollow Corporation. But we can do better.

## The Current Environment

Today, automation is reversing the problem of cheap overseas labor and increasingly bringing manufacturing back to our shores. We are only at the beginning of this new cycle. Meanwhile, a new entrepreneurial economy is bursting forth. Design is moving to center stage. Our business culture has evolved and attitudes have re-aligned. In sharp contrast to the past, creative employees have finally gained the acceptance and respect they deserve for the crucial role they play in organizational success. The business climate is faster-paced, than ever—rapidly changing, and multicultural. Staunchly individualistic leaders backed by a computer savvy workforce characterize our high tech companies, and increasingly, our entrepreneurial ventures. It is important to appreciate that sequential charts of managerial jargon are no longer well received. Such things impose uniformity, and uniformity is anathema to today's creative workforce. Under these circumstances, it is extremely challenging to manage product design using yesterday's managerial paradigms.

Along with previous models, Lean has proven its worth. But once again, current conditions call for an entirely new point of view—a clear and simple model that works with creative organizations that have no patience with past modes of operation—a model that adapts to most every organization regardless of mission and organizational structure. We all seek efficiency and excellence in our design and manufacturing processes, and we emphasize these objectives more than we do any others. Today, for the release of any complex product, we need a new model that *optimizes* and *controls* efficiency and excellence.



## The Controlled Design Management Model

At their root, all the models that have gone before are based on the same kind of thinking—the placing of categories in the right sequence. Now we will come at the problem from with a different set of criteria and a different mode of thought. We will lay aside any disputes between



high-level models, and in fact adapt to most any sequential life cycle that an organization embraces.

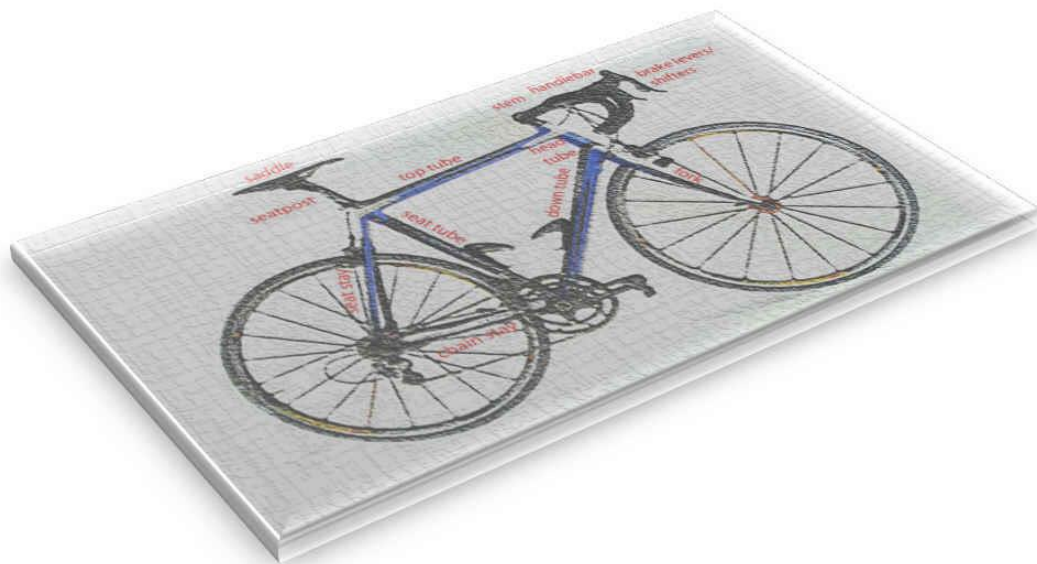
To be meaningful in today's culture, any shift in management strategy must meet certain critical standards. It must be intuitive, adaptable, focused, practical, and measurable. These are the goals we will set out to achieve.

- *Intuitive and Adaptable* – No rigid chart or schematic to implement.
- *Focused* – A practical structure, which zeros in on workflow.
- *Practical* – Departments will implement the model themselves.
- *Measurable* – Management can track progress.

In order to achieve these goals, we must build *self-optimization* into the product cycle and to meet that end, we base our new thinking on Control Systems Theory, as used in such places as computerized system controls and inertial navigation systems. We call it the *Controlled Design Management Model*. For the purposes of this paper, we will circumvent the complex mathematics of Control Theory and present the ideas in an intuitive format, reducing key concepts to graphical form.

## Controlled System

At its most basic form, a *Controlled System* is a process by which an objective or *Input* generates an outcome or *Desired Output*. Suppose, for example, that the system is a bicycle factory and we are trying to build a super bicycle. If the factory, as a system, behaves appropriately, then the factory will output the desired output – a super bicycle.



If, on the other hand, the factory does not operate appropriately, the output will be an undesired outcome – perhaps a tricycle. It will be useful to reduce this to graphical form. (See Figures 3a and 3b.)



Figure 3a – Controlled System



Figure 3b – Uncontrolled System

This may seem rather simplistic, so let's build on it. To make the system self-optimizing, we add a feedback loop to the above diagram. (See Figure 4.) When the desired outcome becomes equal to the desired objective, then the error (or difference between objective and outcome) will be zero. Else, corrections are made (called “pivoting” in Lean Theory) until we eventually arrive at the MVP or initial product deployment.



Figure 4 – Simple self-optimizing Controlled System

Let's see what this elementary flow chart accomplishes. We plot the input and output of the above system, where *Time* is the X-axis and *Magnitude* is the Y-axis and produce a graph. The process swings back and forth until it navigates the optimal path. (See Figure 5. Note the similarity to an internal navigation system.)

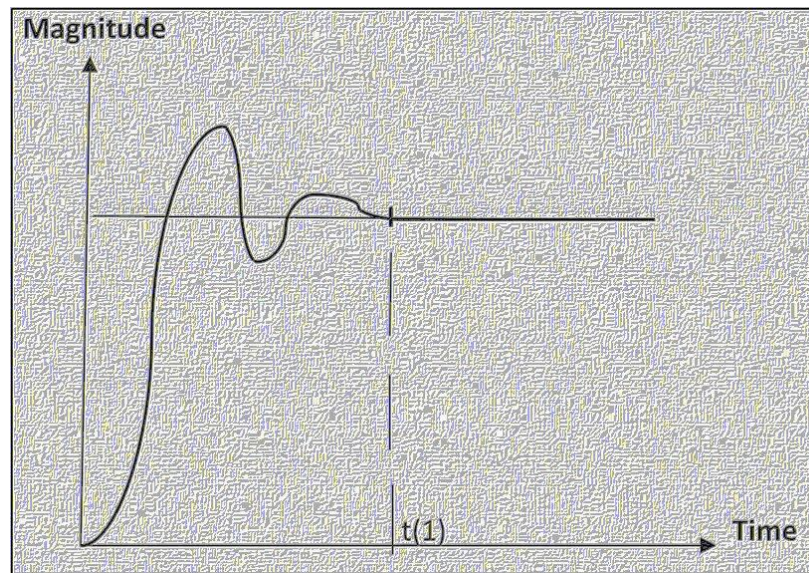


Figure 5 – Self-optimization through a feedback loop

From Figure 5, we surmise that the output reaches steady state, at  $t(1)$  which is when the desired objective is equal to the desired outcome, rendering the error equal to zero. The behavior of the output prior to reaching  $t(1)$  is called the *transient response* and beyond  $t(1)$  is called the *steady state response*.

- *Transient Response* is composed of *idea, concept, feasibility, and definition* (from the Traditional Model).
- *Steady State Response* is composed of *Deployment, Growth, and Maturity* (from the Traditional Model) and the release of the *Minimum Viable Product or MVP* (from the Lean Model).

Transient Response relates to the problems of developing a product or process. It might look like the following example: *How can we make an elevator reach the twelfth floor more quickly?* In actual practice, it may stop at any number of floors on the way, and even overshoot floor twelve before coming back to open the doors for you. Any number of solutions may be proposed. We examine goals, stretch technology, and make tradeoffs.

Steady State Response deals with entirely different concerns. The MVP of an optimized elevator schedule is ready to launch. *How can we standardize, market, deploy, and improve the new design or schedule?*

Can we control how fast the outcome will reach its objective? The answer is *yes*. Goldman, Shieh, and Chen proved this many years ago by using the *Second Causer Form* of continued

fractions expansion.<sup>4,5</sup> Let's look at it in graphical form. By applying a few minor modifications to Figure 4, we have a self-optimizing module:

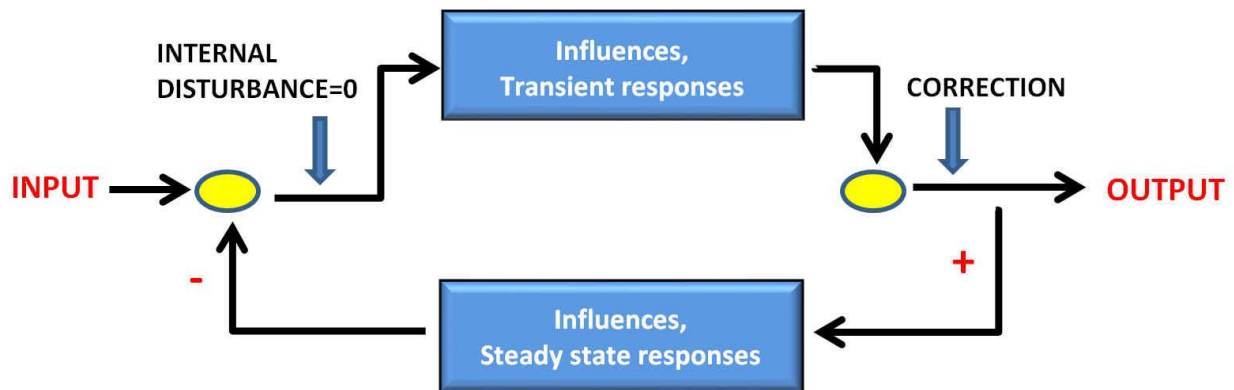


Figure 6 – Controlled Design Management Model

Figure 6 differentiates *Transient* from *Steady State* responses and adds an *Internal Disturbance*, representing noise due to poor product design, faulty test equipment, poor engineering, and other considerations. The optimization process reduces such noise closer and closer to zero via the process of a feedback loop. Mathematically speaking, this is the same controlled system as in Figure 3(a), but this representation depicts the separate influences of the transient and steady state responses.



## A New Perspective

What advantages does the Controlled Design management Model offer over the Lean and Traditional Models? The first is simply knowing which phase of the model contributes to the transient portion—*idea, concept, feasibility, development*—and which phase contributes to the steady-state portion—*final deployment, growth and maturity of the design*. For management, this is critical.

- By controlling the part of development that contributes to the transient response, management can optimize the rise time and minimize time to deployment.
- By controlling the factors that contribute to the steady state response, management can optimize the deployment, growth, and maturity of the product.

A mid to large organization includes many and varied departments through which product development flows from idea generation to maturity. What are some of the advantages to our new model?

- By describing our model in the language of the digital age, each individual department can easily put it into practice.
- Each department is responsible ONLY for what it can control. Each is given a unique decision input and desired output.
- Each department can optimize its output using the model. This, in turn, yields an optimized organization. An optimized organization is, quite simply, the sum of the optimized departments.

## A Practical Example

Let's optimize an organization using a Controlled Design management Model. For clarity, this particular enterprise is engaged in the deployment of a product and has just three primary departments:

- **MARKETING DEPARTMENT** – Produces market research, and marketing planning. The input to this department is *idea generation* from its founders, its research wing, or its own internal analysis. Its output is the *product concept*, complete with all the required features and characteristics that the market requires in tandem with a marketing plan for a successful launch. Marketing's output serves as the input for Systems Engineering.
- **SYSTEMS ENGINEERING DEPARTMENT**: Translates the marketing requirements into engineering concepts, tests their feasibility (simulation), and produces the required technical maps and schematics to be able to create a working prototype. Its input is the output from Marketing. Its output is the *technical representation of the product*, including mathematical and simulation results, schematics, and mock-ups. This becomes the input for Applied Engineering.
- **APPLIED ENGINEERING DEPARTMENT**: Creates and tests a physical prototype until it is ready to deploy. (We're not taking into consideration production or logistics in this example.). Applied Engineering starts with the output from System Engineering. Its output is the *finished prototype* ready for testing and then deployment by Sales.

We have three departments. Each is solely responsible for the optimization and efficiency of its own particular function within the organization. Each is in a dependent, sequential relationship with two other departments. Now, we link the individual department's optimizing flow chart (from Figure 6) into one companywide Controlled Management Model. (See Figure 7.)

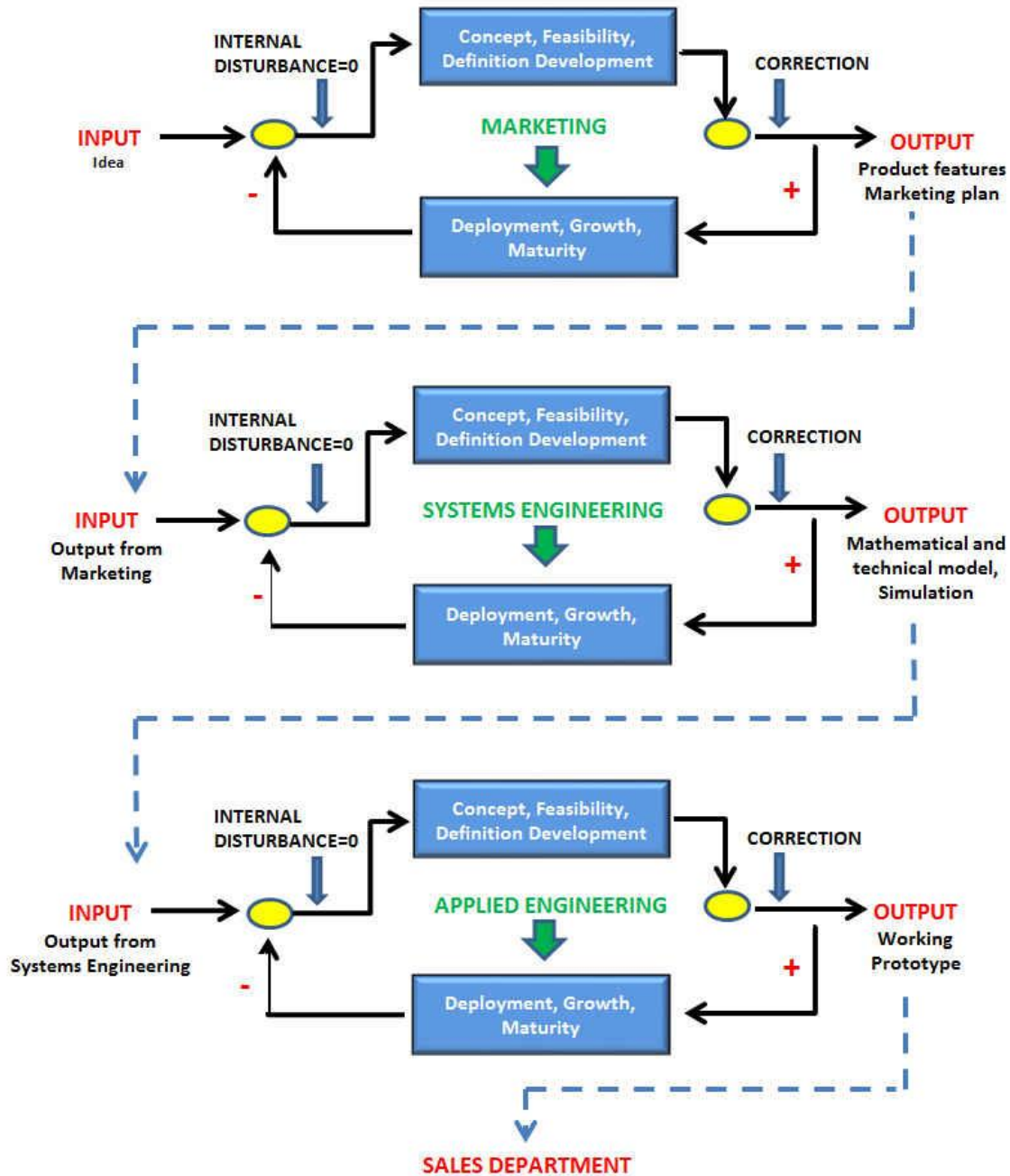


Figure 7 – Optimized Departments

Let's look at application. Based on Figure 7, it's clear that to achieve optimum productivity, a department must minimize internal disturbances. Examples of such disturbances include underperforming employees, faulty data, equipment malfunctions, changes in existing

regulations, policy changes induced by government, budgetary restrictions, new competition, company restructuring. All of these are down-to-earth practical matters, as are the corrections, which are ordinary responses and decisions. What is new is the simple structure of the decision-making process and the ability to map it and to know exactly where, in the larger picture, you are at any given time. That helps eliminate bottlenecks and confusion, and helps address a problem early—before a weakness becomes magnified down the line.

## Conclusion

Does the Controlled Design Management Model meet the goals stated earlier in the paper?

- *Intuitive* – The management system is readily understood and implemented using visual tools in the language of the digital age. It entirely bypasses complex mathematics as well as the sequential categorization of past models.
- *Adaptable* – It does not impose a particular organizational structure but rather adapts to any.
- *Focused* – Departments do not involve themselves in the optimization of other departments—each is concerned only with what is under its direct control.
- *Practical* – It provides a roadmap for effectively optimizing and controlling the release of any new product. Each department’s optimization is a benefit to the workflow of the entire organization.
- *Measurable* – Because the sum of independent optimized departments adds up to the optimized organization, upper management can easily map and manage the progress of each department and the entire organization. Even in a complex organization, it is a simple matter to identify the bottlenecks in the process.

The Controlled Design Management Model works with the same basic material as all previous models—people, ideas, and structure—but does so from an entirely different perspective, using different thinking and tools—the very same principles as electronic control system design. It provides a practical digital approach in a digital age.



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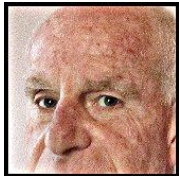
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## Graphics

Flow-charts by Moises Goldman and John Jonelis.  
Graphics from MS Office.

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