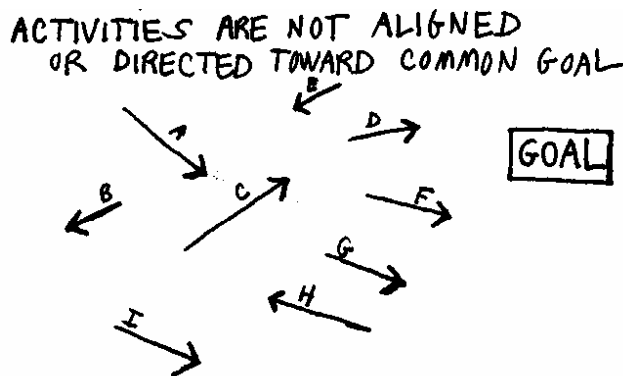


## Lesson Three: Systems Thinking & Operational Capability

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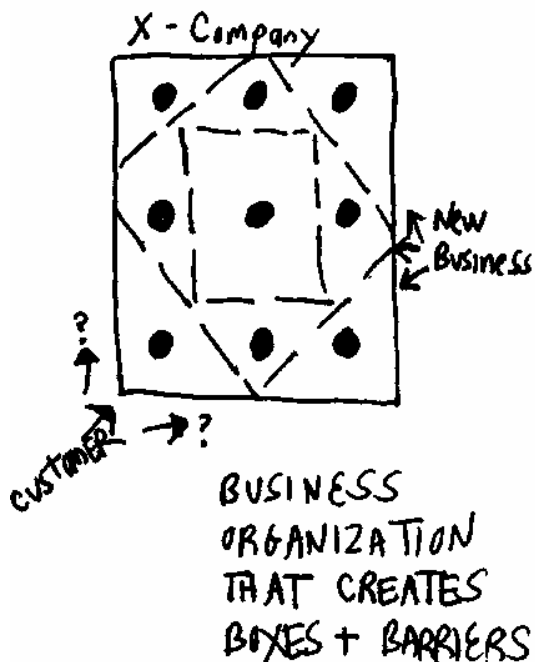
### A. Key Learning Points

1. Although we use the word “system” to describe complex organizations such as schools, health care, transportation, and telecommunications, we typically struggle to manage systems in a truly integrated, and wholly interdependent way. The drawing below illustrates how individual activities or functions within a business are not always effectively aligned or directed toward a common goal. When this happens, our business systems lose potential performance capability and value.



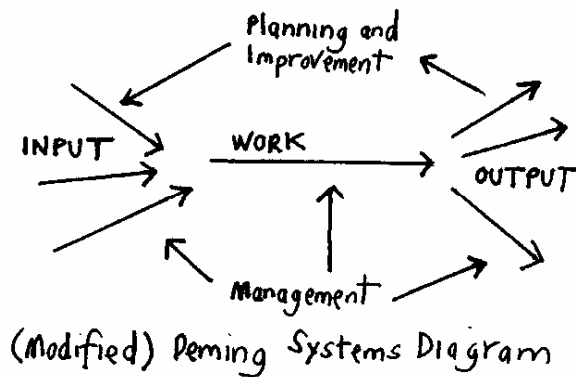
2. We tend to make our systems more “manageable” by breaking them down into sub-elements, functions, and activities. We then assign managers specific responsibility and accountability for performance of the functions that are within their “span of control.” As a result, we emphasize and tend to achieve functional performance in each of the activity areas. The figure below (see page 2) illustrates how

an organization tends to divide itself into separate functional areas. This structure inhibits interdependent work and responsiveness to customer needs and emerging business opportunities.



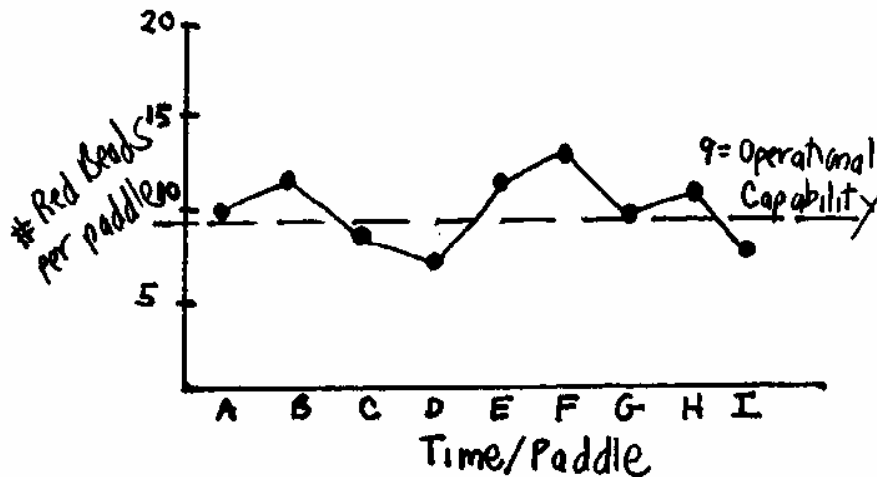
3. We assume that overall business performance will result from the sum of high-performing functional activities; but, functional performance does not guarantee overall system performance.
4. "Sub-optimization" is the technical word to describe management methods that emphasize functional performance at the expense of overall business system performance.
5. Customer satisfaction, loyalty, and profitability is determined by overall capabilities and actual performance of integrated business systems. Although managers tend to sub-optimize, customers focus on the overall value of the whole product or service.
6. A "system" is a network of interdependent activities that are directed toward a common purpose or goal.
7. High-performing businesses design and manage wholly integrated business systems that maximize customer and shareholder value. The drawing below shows an effective business system that takes raw materials and concepts (inputs) and applies work activities to generate products and services (outputs) that customers value. The system has a planning and improvement loop to assure quality and innovation. Management is responsible for design, direction, and supervision of integrated activities. Quality and shareholder value are designed, developed, and assured at all stages of the

business system. This minimizes the need and costs associated with inspection and rejection of outputs prior to distribution. It also maximizes return-on-investment by designing quality into the whole system rather than inspecting it out.



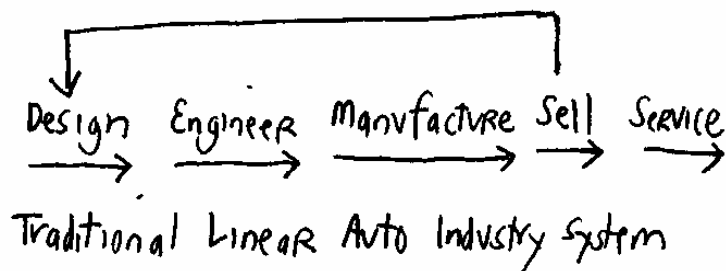
8. 85 percent of business performance is determined by the design and management of business systems. Effective business systems may compensate for weaknesses in the work-force, but the best workers in the world will never make up for ineffective business systems. Dr. Deming conducted the “Red Bead Experiment” to demonstrate this point.
9. “Operational Capability” is the technical term to describe the actual measured ability of a specific system to produce a desired result. Operational capability is determined by design and management of work processes and business systems. The best workers in the world will not succeed if their work systems do not have the operational capability required by the market place. This is why Dr. Deming said, “When you ask a worker to do what they can not do, they wish to give up.”
10. “Quality Specification” is the technical term to describe the desired result or performance target for a specific work process or business system. Quality specifications are determined by management based on their assessment of customers’ expectations for product or service quality. Quality specifications set the goal or target. But goals and targets are useless if there is not sufficient operational capability to achieve them. This is why Dr. Deming said, “A goal without a method is nonsense.”
11. Quality managers are responsible for designing and managing business systems that have the “operational capability” to achieve the desired “quality specification.” This requires systems thinking and emphasis on process design, management and continuous improvement. Bribing, scaring, and otherwise exhorting labor to achieve quality specifications that exceed actual operational capabilities is a recipe for disaster.
12. A run chart is a line graph that illustrates the performance of a business process or system over time. It is a useful quality tool that helps managers and labor understand the variation and operational capability of a business process or system. The figure below is a run chart that illustrates the number of errors (Red Beads) produced in 9 successive batches (paddles) of production or service. The chart shows us that errors vary between 8 and 14 per paddle. It also shows us that (as an average or

“mean”) the process has an approximate operational capability of 9. This information is useful to predict future performance and manage continuous improvement of the work process.



B. Real World Examples and Considerations for Practitioners

1. A student’s experience in today’s public school system is typically divided into functional units that include grade levels, courses, and extra-curricular activities. Students typically demonstrate competence in each of these functional areas as they “pass” to higher levels. In many cases, however, the student’s overall learning experience is considerably less than the sum of the individual experiences because the school’s functions are not wholly aligned and integrated to maximize overall student success. Some examples of typical gaps in our school “system” are: links between grade levels, links between courses offered in a specific subject area, links between elementary schools, middle schools, high schools, and colleges, and links between school and career.
2. In the 1980’s the American auto industry experienced adverse results from poor systems design and integration. Cars were designed, built, and sold in a linear process that took as much as 4 years to move a car from conception to the dealership (see illustration below).



This process involved a lot of rework. For example, designers often created concept cars that were too expensive to manufacture and were difficult to sell and service easily. Today, American automakers are using cross-functional teams to accelerate and improve integration of car development. The average time from concept to market is now approximately 28 months.

3. Technology has increased customer expectations for integrated, timely production and service delivery. Technology has also increased the potential for businesses to improve their business systems. For example, Dell Computers has created a thriving business built on direct links between customers and manufacturing that eliminate retail, wholesale, and inventory costs (go to [www.dell.com](http://www.dell.com) to see how). FedEx offers customers real time information that expedites shipping and tracks location, progress, and status of individual packages worldwide (go to [www.fedex.com](http://www.fedex.com) to see how). Walmart uses a point-of-purchase system that provides real-time information and instructions directly to its suppliers to restock items in specific stores based on daily customer purchases and store inventory. The parts for Saturn automobiles typically arrive at the plant on the same day that they are used to build a specific car.
4. If a restaurant promises you it will deliver sandwiches within 30 minutes, it must have the operational capabilities to do so. This requires effective integration of order taking, food preparation, route scheduling, and delivery. The system must also anticipate challenges associated with large orders, special orders, peak demand periods, and unreliable delivery vehicles.
5. A customer might tell you that (s)he is pleased with some aspects of your service and disappointed in others. But in the end, it is the customer's overall impression of your business's service and products that influence their decision to continue to buy from you (assuming that they have a choice).
6. If you have 400 customers who eat lunch between 11:30 am and 1:30 pm each day, you must have the operational capability to serve (on average) one customer every 3.5 minutes (400 customers divided by 120 minutes). If you must enter 600 documents into a database each (five day) work week, you must have the operational capability to enter 120 documents per day. Success in both these examples requires appropriate staffing levels and effective business systems to respond to the market demand.
7. If the average ratio of students to teachers in a typical public school is 28:1, what is the students operational capability to learn effectively?
8. If a call center operator is expected to answer 35 calls per hour, what is his/her capability to provide quality service?
9. If you are a casual or serious investor, you will recognize run charts as a valuable tool to illustrate variation, trends, and operational capability of the stock market and other financial instruments.

B. Recommended Reading Assignment & Highlights – All selections are from Walton, *The Deming Management*

Chapter 4: The Parable of the Red Beads

- *Variation is part of any process.*
- *Workers work within a system that – try as they might – is beyond their control. It is the system, not their individual skills, that determines how they perform.*
- *Only management can change the system.*

Chapter 22: Shifting Gears: Ford Motor Company

*If Dr. Deming could work wonders with Ford, whose founder had introduced continuous assembly lines more than sixty years ago, he could do it anywhere. Ford was quintessentially American in its approach to quality. The company typically manufactured products to specifications, then sorted out those that didn't conform .... "there is nothing wrong with that system except that it never leads to improvement – and it's expensive."*

D. Additional Resources and Links to Others Sources

Deming, W. Edwards. *Out of the Crisis*. (MIT, 1987), Chapter 1 Quality, Productivity, Lower Costs  
Deming, W. Edwards. *The New Economics* (MIT, 1993), Chapter 3, Introduction to a System  
Glasser, William *The Quality School: Managing Students Without Coercion* (HarperPerennial, 1992)  
Senge, Peter M. *The Fifth Discipline*. (Doubleday, 1990), Chapter 6, Natures Templates: Identifying the Patterns that Control Events

E. Questions for Reflection and Discussion

1. Describe one example of a “red bead” that you have experienced recently. Explain how this “red bead” was a symptom of failures in systems design and/or management.
2. Describe a specific example that illustrates how the “operational capability” of a system or process impacts your professional or personal life.