

M

DAY 10:

A SYSTEM OF PROFOUND KNOWLEDGE

PARTS A and B

12 Days to Deming

DAY 10: A SYSTEM OF PROFOUND KNOWLEDGE, PARTS A AND B

(9.00am – 1.00pm; 2.00pm – 6.00pm)



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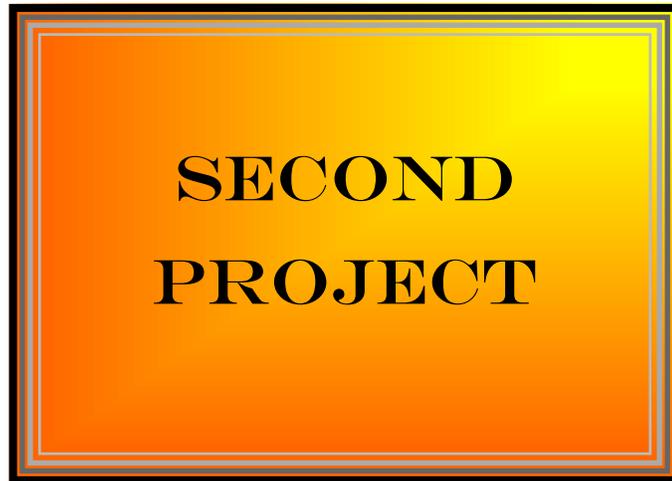


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DAY 10: A SYSTEM OF PROFOUND KNOWLEDGE, PARTS A AND B



SECOND PROJECT

Welcome to the Second Project! This is the big one: linking together Deming's teaching in the mid-1980s, particularly on the 14 Points and the Deadly Diseases, with his teaching on the System of Profound Knowledge near the end of his life as expressed in his May 1990 version that we'll be using throughout.

I hope you found my guidance on your preparation for this project to be useful and that you are now ready to get started with the four-step procedure on Part A of the System of Profound Knowledge. One of the suggestions in that guidance, particularly relevant to issues with which you are already relatively happy (and I believe there will be quite a few in Part A), is to think about how you would introduce such issues to your keen, interested friend! I'll expand a little more on that here.

Not only did Dr Deming write extremely concisely, he would consistently use a few words and terms in very specific ways: ways that might not always be apparent to a newcomer (a description which, having reached this late stage of the course, naturally cannot be applied to you!). But you'll need to ensure that you make your keen friend clear about what Deming meant by such terms. A good example is, of course, the word "system" which you know is the subject of this first half-day. To get you started, I have tried to imagine myself in your shoes and have then included my own attempts at translating *the first two items* in each of the four parts of the System of Profound Knowledge in ways which your interested friend will be able to understand. In order to give you plenty of ideas, I have sometimes written rather more than you could be expected to do in the limited amount of time available—so don't take my efforts as models!

Before you begin, I'll make a few introductory remarks both about Part A and also the project as a whole. Firstly, Dr Deming starts out today with a definition of a "system" which is similar to that which you saw at the beginning of the first of Balaji Reddie's four Preludes. For the moment I'll abbreviate it to "[a network of components that work together](#)"—an emphasis with which we are already very familiar via the importance of cooperation, "All One Team", etc. And surely, isn't this what people these days are driving at when they talk of "joined-up thinking"?

He next immediately moves on to two examples of non-human systems: a car and a vacuum-cleaner. If just one component is getting worn or completely breaks down, this harms or maybe totally halts what other components can then do—however good they are. And therefore that system, i.e. the car or the

vacuum-cleaner, no longer works as it should, or maybe no longer works at all, until the problem is solved. Referring to Prelude A page 2, that faulty component has become the “most important” part of the system.

But that’s relatively easy: repair or replace the faulty component. However, that’s not so easy if the components are human! How can human “components” be enabled and encouraged to do their jobs in ways that benefit and contribute to the smooth and efficient running of the organisation as a whole? Surely that brings us straight over to Part D of the System of Profound Knowledge: Psychology. Further, as we shall see, Part C: Theory of Knowledge also has a big part to play in enabling people to do their jobs for the best benefit of the system, i.e. for the organisation. And we have, of course, been very familiar for a long while with the way that Part B: Understanding Variation is essential both for discovering the source of problems: special causes or the system itself, and for the whole matter of improvement. Thus again, I want that other important phrase from the first sentence of Deming’s introduction (Day 9 page 24) describing the four parts as “all related to each other” to stay at the forefront of your mind.

DemDim Chapter 18 provides some elaboration on Dr Deming’s ultra-compact writing. The chapter contains references to other parts of the book and occasionally to other sources as well. Naturally, you won’t have time during the project to explore other sources—those references are mainly there for your future use. In fact, you won’t even have time to read through all of the referenced material which is elsewhere in *DemDim*—so don’t try! My suggestion is that, if you feel like it, take a *quick* look at some of such referenced material if it particularly interests you, so that you will have a rough idea of what’s there just in case you find you can use it in this project.

During what follows in Days 10 and 11 I have also added what I hope you will find to be a few useful expansions and helpful hints. Sometimes I shall repeat material that you have already seen in Balaji’s Preludes. However, any attempt to provide comprehensive “back-of-the-book” discussions on the material would be doomed to failure: that would take up far too much space and, even so, could never be anywhere near sufficient. I have therefore restricted myself to some very brief discussions in the Appendix, but you may still find these helpful, particularly for tackling the Activity in Step 4 of the four-step procedure.

I hope you are working at a reasonable-sized table or desk! For, if you have been able to carry out the copying that I suggested at the top of Day 9 page 30, you can now have no less than five items in front of you for your assistance as and when you need them. They are (a) Peter Scholtes’s diagram, (b) your annotated summary of the four-step procedure, (c) the table of the 14 Points and Deadly Diseases which summarises your work in the First Project, (d) Balaji’s Preludes, and (e) *DemDim* Chapter 18.

This morning’s Part A contains considerably more material in the May 1990 version than any of the other three parts. Thus, rather than also cramming the relevant Activity 10–a into this morning, I am postponing it until the start of the afternoon. Even so, you will still need to move through the individual items rather faster than during the other parts. Fortunately, you are already quite well-grounded in the concept of a system.

As usual, Dr Deming’s own words here are in blue to make them easily distinguishable from my own comments. I have not added comments if the item seems self-evident or is familiar to us from earlier in the course.

Finally—one more time!—please pay some attention to my guidance about timings, else otherwise you are highly unlikely to get through this project in anything like the recommended time. If, during your preparation, you have already made yourself familiar with most of the content of the initial browsing sessions then you can, of course, make those sessions shorter than I’m suggesting. What’s important at this early stage is for you to gain *some* comprehensive idea of the *whole* System of Profound Knowledge, not just some detailed understanding of bits and pieces of it and none of the rest! Again, this is just your first exposure to this remarkable—and remarkably valuable—work. You have the rest of your life to build upon it.



PART A: APPRECIATION FOR A SYSTEM

Step 1: Browsing session

Relevant reading:

Prelude A: "Four Preludes and a Coda": pages 1–6. (From now on I'll simply refer to "Preludes".)

DemDim: pages 264–270.

Today's material: pages 3–14 [WB 154–165].



The rest of this page and the next sixteen pages (pages 3–19) are also on Workbook pages 154–170.

Step 2: Dr Deming's May 1990 version

1. What is a "System"?

A system is a network of functions or activities (sub-processes, stages—hereinafter components) within an organisation that work together for the aim of the organisation. The mechanical and electrical parts that work together to make an automobile or a vacuum-cleaner form a system. [i.e., you could substitute an "automobile" or a "vacuum-cleaner" for the "organisation" in the first sentence and it's still true.] The schools of a city, including private schools, parochial schools, and universities, provide an example of components that ought to work together as a system for education. [This last example is further developed at the top of page 11.]

(Remember, my writing that follows here focuses on what you might say to your interested friend:)

No messing about! We're straight in here with what I think may be the most important idea in all of Dr Deming's teaching. And it's not difficult—it's just different from the way that most people in management, or in government, or in any kind of authority, seem to think. The reason why I believe it's so important is that, when you come to some other things in Deming's teaching that you might initially think are kind of crazy, referring back to this concept soon starts helping you to see what he's driving at, and why. And all of a sudden it starts making a lot more sense. At least, that's what's been happening with me.

So this is about what Dr Deming (amongst others) refers to as a "system" and describes as a "network". To illustrate this, William W Scherkenbach (a Director in Ford of America) drew the picture on Day 9 page 9 and simply said: "This is what any organisation is!". Let's look at that page now. What do we see? Two things. Firstly, lots of boxes—representing the "components" of the system. Secondly, lots of lines joining the boxes—indicating that the components are somehow linked up with each other. Considering Deming's car and vacuum-cleaner illustrations, if any component fails or, at least, doesn't work as well as it should, that obstructs or even wholly prevents other components from doing what they're supposed to do—never mind how good they are. Thus the whole system either underperforms or stops working altogether. So that's simple enough.

Deming is mostly concerned though not with "mechanical and electrical parts" but with people. So then several, maybe all, of the "components" (represented by the boxes in Bill Scherkenbach's diagram) will be individuals or groups of people. Then what's the message from the diagram? Basically, it's just the same! What a person or group of people is able to do depends a great deal on what other people or groups do. And what other people or groups can do is greatly affected by what yet other people or groups do or have done.

I'd sum it up like this. "Conventional" management focuses on the boxes in that picture "in their own right". By contrast, Deming-guided management focuses on how the boxes are helped or hindered by each other—and that's the lines in the picture. As I said, it's not difficult—just different. But what a difference it makes!

There is in almost any system interdependence between the components thereof. The greater the interdependence between components, the greater be the need for communication and cooperation between them. *[Here and elsewhere, note the implicit comparison between the vertical and horizontal concepts of an “organization chart”.]*

As you can see, after his initial “mechanical and electrical” illustrations, Deming is now immediately concentrating on human systems. The first sentence is already covered in what I wrote on the previous page. And surely it also follows that the more the people or groups depend upon each other for being able to do their jobs as well as possible, the greater is their need to be in touch with each other and to be willing and able to help each other.

(From now on there will always be a little space left after each of Dr Deming’s items for your notes—see below.)

(That’s the end of my sample commentaries for Part A. So over to you from now on. As discussed previously, use the blank space after each item for your reactions, comments, thoughts, questions, references to past experience, links with any of the 14 Points or Deadly Diseases, explanations for your friend—as you prefer. But don’t get carried away—keep an eye on the little clocks!)

The components need not all be clearly defined and documented: people may merely do what needs to be done. *[In other words, we should keep a sense of proportion between documentation as a real aid and documentation for documentation’s sake. I think that few people these days will disagree with that!]* All the people who work within a system can contribute to improvement, and thus enhance their joy in work. Management of a system therefore requires knowledge of the interrelationships between all the components within the system and of the people that work in it. *[Remember “all related to each other”? You’ll immediately see plenty of linkages here with Part D: Psychology.]*

The aim of the system must be clear to everyone in the system. [What is the system for? What should it be attempting to do? For, without clarity on such matters, on what could decisions be sensibly based?] Without an aim, there is no system. [There couldn't be a system if neither management nor their staff really understand what they are supposed to be trying to do, nor why! On what could they "work together"?] The aim is a value-judgment. [i.e. the aim or purpose of the system is subjective. As Deming said at the 1990 presentation to senior executives: "The aim of a system is not a theorem: you don't derive it from axioms and corollaries." See Deming Speaks to European Executives, BDA Booklet A10 page 8 and DemDim page 265.]

[Notice the strong connection between "the aim" and "constancy of purpose", the latter being the main feature of the first of both the 14 Points and the Deadly Diseases.]

The aim proposed here for any organisation is for everybody to gain—stockholders, employees, suppliers, customers, community, the environment—over the long term. For example, with respect to employees, the aim might be to provide for them good leadership, opportunities for training and education for further growth, plus other contributors to joy in work.

[Were I ever asked to select just part of one sentence from Dr Deming's writing, and paint it in big letters for all to see, it would be the opening words of this paragraph: **"The aim proposed here ... is for everybody to gain."** It is one of those things from Deming that, at first glance, may seem hopelessly optimistic: **"everybody to gain"**. But, if that in effect is **not** the aim of the system, why **should** those all-important "components" of the system—people—"work together" for achievement of whatever that other aim is? Would you, if you were going to lose out as a result?]



2. Optimisation of a system

Optimisation means accomplishment of the aim: everybody to gain. *[Of course, this is unlikely to be possible in the short term. Deming is thinking long-term.]* Failure to optimise, suboptimisation, causes loss to everybody in the system. *[—again, in the long term. Some may gain in the short term, but if their main objective is to do so then optimisation and the resulting benefits to all will never happen. So even those who gain in the short term will gain less in the longer term than would otherwise have been possible—unless perhaps, as soon as they’ve made their short-term gain, they quickly move elsewhere to do the same again. Hence Deadly Disease 4 of “Management job-hopping” or, as Dr Deming more politely expressed it, “Mobility of management”.]*

For optimisation, a system must be managed. Management’s responsibility is to strive toward optimisation of the system, and to keep it optimised over time. An additional responsibility of management is to be ready to change the boundary of the system to better serve the aim. *[For example, it might be wise to include factors not previously taken into account when decision-making.]*

If the aim, size, or boundary of the organisation changes, then the functions of the components will for optimisation of the new system *[need to]* change. Time will bring changes that must be managed to achieve optimisation. *[Two important points in one here which I'd combine by saying that optimisation cannot be static—it's dynamic.]*

Growth in size and complexity of a system, and rapid changes with time, may require overall management of efforts of components. The number of people in top and upper management for this purpose should be kept minimal. *[That might perhaps seem to be an unusual point. But surely there is need at the highest level for those concerned to work as "All One Team", particularly with something this major: the larger the number, the less feasible this becomes.]*



The components of a system could in principle, under stable conditions, manage themselves to accomplish their aim. *[Clearly so if the components are human, but also more broadly in other well-designed systems.]* A possible example is a string quartet. Each of the four members supports the other three. None of them is there to attract individual attention. Four simultaneous solos do not make a string quartet. They practise singly and together, to accomplish their aim. Their aim is challenge for self-satisfaction, and to provide pleasure to listeners. *[This was one of Deming's favourite illustrations—and indeed, who could argue against it? A larger version of the same idea appears at the top of page 10.]*

Any system needs guidance from outside. The string quartet mentioned above may well study under a master. The master need not be present at a performance. *[C.f. the final Obstacle to the Transformation on Day 7 page 35. Dr Deming would often express this in such terms as: "Those within a system may understand everything there is to know about the system—except how to improve it."]*

A large organisation will require someone in the position of aide to the president to teach and facilitate Profound Knowledge. [This was Bill Scherkenbach's role in the Ford Motor Company (remember, his was the "boxes and lines" diagram we discussed on page 3). Lloyd Nelson's role at Nashua was similar. In both cases, the "president" was the CEO: Don Petersen in Ford and Bill Conway in Nashua. Chapter 16 in *Out of the Crisis* is particularly helpful on this issue.]

A flow diagram [remember what he means by this term: the famous diagram on Day 9 page 2] is helpful toward understanding a system. By understanding a system, one may be able to trace the consequences of a proposed change. [—importantly including **negative** consequences that might otherwise be—and very often are—overlooked by enthusiasts for the proposed change.]



An example of a system, well-optimised, is a good orchestra. The players are not there to play solos as prima donnas, to catch the ear of the listener. They are there to support each other. They need not be the best players in the country.

[To illustrate, Dr Deming sometimes drew a little diagram like the following:



*Low and high interdependence are respectively to the left and right. Paradoxically, a (ten-pin) bowling **team** can largely succeed through independent effort and brilliance of its players. An orchestra cannot: it needs a much higher degree of genuine teamwork. A business organisation needs even more.]*

A business is not merely an organisation chart *[of the conventional kind]*, all departments striving for individual goals (sales, profit, productivity). It is a network of people, materials, methods, equipment, all working in support of each other for the common aim.

A system of schools (public schools, private schools, parochial schools, trade schools, for example) is not merely pupils, teachers, school boards, and parents. It should be, instead, a component in a system of education in which pupils from toddlers on up take joy in learning, free from fear of grades and gold stars, and in which teachers take joy in their work, free from fear of ranking. It would be a system that recognises *[and appreciates]* differences between pupils and differences between teachers. The reader, after study of the rest of this paper, might wish to try to construct a system of medical care. *[As you will surely remember, you used this suggestion in Day 9's Major Activity, and thus there is no need to comment on that here. So concentrate instead on the points Deming raises earlier in this item.]*

The performance of any component is to be judged in terms of its contribution to the aim of the system, not for its individual production or profit, nor for any other competitive measure. *[As we know, Deming sometimes spoke of the need for "transformation of management". This item is a good illustration of how necessary that is.]* Some components may operate at a loss to themselves *[from the viewpoint of the conventional style of management]* for optimisation of the whole system, including the components that take a loss. *[Think back to all that you learned in Major Activity 8-d.]*



It would be poor management, for example, to purchase materials and service at lowest price, or to maximise sales, or to minimise cost of manufacture, or design of product or of service, or to minimise cost of incoming supplies, to the exclusion of the effect on other stages of production and sales.

It would be poor management to save money on travelling expenses without regard to the physical welfare of the travellers. For example, it would be bad management to save money on a night-rate for transportation, which would force the traveller to be up most of the night to take advantage of the reduced rate, but unfit for duty next day. It might be better for the Travel Department to ensure, at whatever cost, that the traveller arrives alert and well. *[This stems from a particular experience which is related on DemDim page 354.]*

Any system that results in a Win-Lose structure is suboptimised.

Optimisation of a system should be the basis for negotiation between any two people, between divisions, between union and management, between competitors, between countries. *[How sensible—yet how rare.]*
Everybody would gain.



Some examples follow of suboptimisation in the management of people, causing losses unknown and unknowable: [You might find it useful to refer back to the “Optimise or maximise?” section beginning on “Preludes” page 5. Deming is simply pointing out here that these examples all indicate the existence of suboptimised rather than optimised systems. Thus they are all indicating that there is a better way.]

- The merit system (actually, destroyer of intrinsic motivation; emphasis is on rank, not on the work);
- Grading in school, from toddlers on up through the university;
- MBO (management by objective), MBIR (management by imposition of results);
- Incentive pay;
- Business plans: each division with its own business plan, not coordinated toward an aim; [Don't just read the first two words here!]
- Work standards for production; quotas for sales; quotas for accidents and breakdowns; [If necessary, refer back to Day 5 page 27 to remind yourself of more about what Deming meant by “work standards”.]
- Competition for share of market;
- Barriers to trade;
- Anybody, team, division, establishment (management, union), gouging the other in negotiation.

Fortunately, precise optimisation is not necessary. One need only come close to optimisation. As a matter of fact, the precise optimum would be difficult to define. The loss function will apply (as emphasised by Taguchi). The loss function will be at the bottom (minimum loss) a parabola. Curve and horizontal tangent are for practical purposes coincident over a short range. [You could look back at Day 7 page 22 to remind yourself about the shape of the Taguchi loss function. The important sentence in this paragraph is the final one which now follows:] One may move away a short distance along the curve in either direction from the optimum, but rise only an imperceptible distance.

[It is interesting that the Taguchi loss function is introduced here in the “Appreciation for a System” part of the System of Profound Knowledge in this early version rather than in Part B: “Some Knowledge of Theory of Variation”, which is where you will find it in the 1992 version as used in DemDim Chapter 18. (See however Item 10 in Part B later today.) Placing it here in Part A to help in the interpretation of “optimisation of the system” strikes me as particularly appropriate. In The New Economics it is one of the topics that has been moved away from the main writing on the System of Profound Knowledge, in fact to Dr Deming's final chapter: “Some Lessons in Variation”. This is an illustration of how Deming's earlier writing that is being used here has some advantage in the way it is organised.]

There is, of course, no need to include in your comments the technical details of the Taguchi loss function: concentrate instead on what it teaches us.]



That completes the items which Dr Deming included for Part A in his May 1990 version of the System of Profound Knowledge. There were rather more of them than for any of the other three parts. As mentioned earlier, that is why the relevant Activity (concerning links between Part A and the 14 Points and Deadly Diseases) is postponed to the beginning of this afternoon rather than being crammed into this morning. In all other cases, the similar Activity will conclude the relevant half-day.

Step 3: *DemDim* version

Now read through *DemDim* pages 264–270, revising your earlier comments and adding any new points below.

For your later reference (but not now!), the sections of *The New Economics* most relevant to Part A of the System of Profound Knowledge are Chapter 3 and pages 65–67[95–98] in Chapter 4.



(After the break, continue to Activity 10–a overleaf.)



Step 4:

ACTIVITY 10–a

Now it's time to revisit the 14 Points and Deadly Diseases. **In light of your understanding of “Appreciation for a System”, how important is it to adopt the Point or cure the Disease—and why?** (You could refer back to *DemDim* Chapter 3 for fuller wordings of the Points and Diseases.) Write in brief comments if you wish, but sometimes there may be no need. As implied earlier, you are not expected to always think of something new. If something new and important does occur to you, then fine! But, in many cases, what you have written concerning the 14 Points and Deadly Diseases in the First Project may well be directly relevant here also. You can use your completed copy of the table on Day 9 page 28 to guide you on whether to look back. The relevant page numbers in the First Project are indicated throughout these Activities.

As mentioned on Day 9 page 27, in each case please put a number on a 0–5 scale in the box provided. Enter “5” if, from your understanding of “Appreciation for a System” (or whichever of the four parts you are working on), you feel it is *essential* to adopt the Point or cure the Disease. At the opposite extreme, you should enter “0” if you can see *no connection* between them. You may as well be honest—*I’m not there to check up on you!* Use “1”, “2”, “3” or “4” if your judgment lies between those two extremes. You might find it helpful to write a few words describing roughly what those intermediate numbers mean to you. These “ratings” of the connections as you see them will be used on our final day.

(You may find the brief discussion on Appendix page 39 to be helpful for this Activity.)

POINT 1. **Create constancy of purpose.** *(Day 4 pages 16–17.)*

POINT 2. **Adopt the new philosophy. We are in a new economic age, created in Japan.** *(Day 4 pages 18–19.)*

POINT 3. **Eliminate the need for mass inspection as a way to achieve quality.** *(Day 4 pages 20–21.)*

POINT 4. **End the practice of awarding business solely on the basis of price tag.** *(Day 4 pages 22–23.)*



POINT 5. Improve constantly and for ever the system. (Day 4 pages 24–25.)

POINT 6. Institute modern methods of training. (Day 4 pages 26–27.)

POINT 7. Adopt and institute leadership aimed at helping people to do a better job. (Day 5 pages 2–3.)

POINT 8. Encourage effective two-way communication and other means to drive out fear throughout the organisation. (Day 5 pages 4–5.)

POINT 9. Break down barriers between departments and staff areas. (Day 5 pages 6–7.)



POINT 10. Eliminate the use of slogans, posters, and exhortations. (Day 5 pages 8–9.)

POINT 11. Eliminate work standards that prescribe quotas for the workforce and numerical goals for people in management. (Day 5 pages 10–11.)

POINT 12. Remove the barriers that rob hourly workers, and people in management, of their right to pride of workmanship. (Day 5 pages 12–13.)

POINT 13. Institute a vigorous programme of education, and encourage self-improvement for everyone. (Day 5 pages 14–15.)

POINT 14. Clearly define top management's permanent commitment to ever-improving quality and productivity. (Day 5 pages 16–17.)



DISEASE 1. The crippling disease is lack of constancy of purpose. (Day 5 pages 18–19.)

DISEASE 2. Short-term thinking defeats constancy of purpose. (Day 5 pages 20–21.)

DISEASE 3. The effects of performance appraisal are devastating. (Day 5 pages 22–23.)

DISEASE 4. Mobility of management causes instability. (Day 5 pages 24–25.)

DISEASE 5. One cannot be successful on visible figures alone. (Day 5 pages 26–27.)





PART B: SOME KNOWLEDGE OF THEORY OF VARIATION (STATISTICAL THEORY)

Step 1: Browsing session

Relevant reading:

Prelude B: "Preludes" pages 7–14.

DemDim: pages 270–274.

Today's material: pages 20–27 [WB 171–178].



The rest of this page and the next twelve pages (pages 20–32) are also on Workbook pages 171–183.

Step 2: Dr Deming's May 1990 version

1. Some understanding of variation, including appreciation of a stable system, and some understanding of special causes and common causes of variation, is essential for management of a system, including leadership of people.

(Again, the following thoughts are for your interested friend. Thus, clearly, some words and terms used here will need to be "translated", which is why this commentary is relatively lengthy.)

I'll start by using some personal experience to illustrate a few of the words and terms that you will see here.

Long ago I was diagnosed as having high blood pressure, so was put on some appropriate medication and had to visit my doctor regularly for check-ups. However, being a statistician, I felt I should collect some data to find out how the medication was working, rather than simply waiting for the next check-up. Therefore I bought a blood-pressure monitor, kept a daily record of my blood pressures and pulse, and plotted the numbers on some simple charts. 35+ years later, I still do! I've learned a lot from doing so.

First, I found that my blood pressure varied quite a lot from day to day even when there seemed to be no reason for the changes: I felt the same, was doing the same kind of things, and took the readings at roughly the same time each day, etc. There were usually no trends or any kind of patterns apparent in the data: the numbers simply varied up and down, seemingly "at random", over a certain range. A friend of mine refers to that kind of variation as "wobble-wobble"! I can't remember what that range was so long ago: nowadays my systolic blood pressure is almost always between 120 and 150.

Just now and again I get a value outside that range, usually on the high side. When that happens I can often understand a good reason for it, e.g. I'm particularly excited or stressed about something, or I'm suffering from some kind of bug. But occasionally, over the 35 and more years, I've started getting some high values that I can't explain, or even see a slow trend upwards. When that happens I've shown my doctor the graphs and she has changed my medication, and invariably that has brought the variation back to "wobble-wobble" again.

The "wobble-wobble" situation is what Deming refers to in this item as a "stable system". There are bound to be some reasons for the ups and downs (else presumably the blood pressure would stay the same, day after day), but they are probably so many and various—and small—that nobody could identify their individual effects. These are what Deming calls "common" causes of variation: I've learned that every system has them. Causes of variation outside the usual range, or causes which actually change the behaviour of the variation from what it has been over recent readings, are what he calls "special" causes. Not all systems have them, and usually we prefer that they don't: for, without them, we can predict that the variation will continue to be very similar to what we've been seeing recently—and that's very useful in practice.

The reason why Deming says that understanding of such matters "is essential for management" is this: If the system is stable, i.e. the variation is just "wobble-wobble", then relatively high or low values just cannot be explained—in particular, there is then no justification for blaming or indeed praising anybody for such values. It's the same kind of "random variation" as you get when throwing dice or shuffling and dealing playing cards. High or low is then just a matter of luck. Should you praise or blame people merely for being lucky or unlucky? I'd say you're a pretty lousy manager or leader if you do.

2. Variation there will always be, between people, in output, in service, in product. What is the variation trying to tell us about a process, and about the people that work in it?

So we can never eliminate variation in what our processes produce. We can and should, of course, try to reduce it, particularly if the extent of the variation is really troublesome. But how do we set about that? It all depends on whether or not there are special causes affecting the results (remember, there are always common causes). If there are special causes then we need to identify them and deal with them appropriately. E.g., somebody might have been moved onto a particular job without the right kind of training: OK, then provide that training. But if the system is stable (and both theory and experience show that this is more often the case) then, as we now know, individual causes cannot be found: and, in particular, there is no justification for blaming anyone for the results that are being obtained. In this situation, results can only be improved if action is taken to improve the system within which the people are working. Such action is the responsibility of management, for the people working within that system have neither the opportunity nor the wherewithal (nor the authority) to do it themselves.



(So, again, it's now over to you for reactions, comments, etc throughout Part B. Keep an eye on Step 2 in the guidance which was summarised on Day 9 page 29.)

3. Understanding of the capability of a process. When do data indicate that a process is stable? The distribution of the output of a stable system is predictable with a high degree of belief. A process that is stable, in the state of statistical control, has a definable capability.

*[How different, and how much more sensible, than traditional definitions of process capability that involve specifications. Deming is making the very simple point here that, when a process is in statistical control, the **control limits** indicate what it is capable of consistently producing.]*

4. The leadership of people (manager, leader, supervisor, teacher) is entirely different in the two states: stable and unstable. Confusion between the two states leads to calamity. *[Already touched upon, particularly near the end of what I have written for the first item—see the top of page 21.]*

5. Knowledge about the different sources of uncertainty in the system of management. Is the system of measurement stable, in statistical control?

*[The quality of the **measurement process** itself seems to be too little considered by conventional statisticians, let alone non-statisticians. The numbers that are obtained using the measurement process are often never questioned. However, if you're wise, try carrying out repeated measurements of the same thing—e.g. the length of a piece of string (but at different times so that you don't remember what you got before)—you might surprise yourself! Or get some other people to take the measurements as well. This is even more important if that measurement process is likely to be employed under differing circumstances.]*

6. There are two kinds of mistakes in attempts to improve a process, both costly:

Mistake 1: To treat as a special cause any outcome, any fault, complaint, mistake, breakdown, accident, shortage, when actually it came from common causes (tampering).

Mistake 2: To attribute to common causes any outcome, any fault, complaint, mistake, breakdown, accident, shortage, when actually it came from a special cause.

[This and the next item are, of course, very familiar to us from early in the course, including the fact that Mistake 1 is usually by far the more prevalent of the two.]



7. Knowledge of procedures aimed at minimum economic loss from these two mistakes (Shewhart control charts). [See Appendix page 4.]

8. Knowledge about interaction of forces. Interaction may reinforce efforts, or it may nullify efforts. Effect of the system on the performance of people. Knowledge of dependence and interdependence between people, groups, divisions, companies, countries.

*[Some clear connections with Appreciation for a System here, so why is “interaction of forces” in the “Understanding Variation” part? Working together as “All One Team” with common aims and purpose must reduce variation. The reverse statement is perhaps even more obvious: **failure** to work as All One Team is bound to **increase** variation. The analogy of a “tug of war” may be helpful for linking Parts A and B: a “tug of war” is obviously the direct opposite of “pulling together”, i.e. of “working together”, and results in unstable, unpredictable variation.]*

9. [You will see some unfamiliar terms here. I'll briefly explain them in my comments below.] Understanding of the distinction between enumerative studies and analytic problems. An enumerative study produces information about a frame. The theory of sampling and design of experiments are for enumerative studies. Our Census is an enumerative study. Another example is a shipload of iron ore. Buyer and seller need to know how much iron is on board. The interpretation of results of a test or experiment is something else. It is prediction that a specific change in a process or procedure will be a wise choice, or that no change would be better. Either way, the choice is prediction. This is known as an analytic problem.

[If you're interested, there'll be plenty for you to read in time to come. See Chapter 7 of Deming's 1950 book: Some Theory of Sampling, and also his papers: "On a Classification of the Problems of Statistical Inference", "On the Distinction between Enumerative and Analytic Surveys", and "On Probability as a Basis for Action". The Deming Institute—www.deming.org—should be able to help you locate such papers.

It is worth pointing out that Deming's comment regarding "design of experiments" relates to traditional statistical methods. They can only have predictive power if similar circumstances prevail in the future to those in which the experiments were carried out. More enlightened approaches which include that vital matter can usefully contribute to analytic studies.

*The essential issues in this item were briefly alluded to in Obstacle 6 on Day 7 page 30. I'll expand a little on them here. A "frame" is some finite collection or "population". Examples are suggested above by Dr Deming. Given the time and money, a frame can be 100% inspected, enabling complete information about that frame to be obtained (within the limits of our observational powers, etc). Traditional statistical techniques are concerned with sampling some **fraction** of the frame, and trying to infer what **would** have happened in the case of 100% inspection. In either case, the only concern is **what** is in the frame, not **why** it is there. The "**what**" is an enumerative problem; the "**why**" is an analytic problem.*

*Enumerative studies involve no temporal spread, i.e. no relevance over time except for the time during which the data were collected; in particular they imply no **predictive** ability. Yet sensible practical interest is surely on what is to come, not merely on what is past or present. In other words, most "real" problems are analytic, yet most statistical techniques are enumerative—the control chart being a notable exception.*

These matters are further discussed in Part C of the Optional Extras.]



10. Knowledge about loss functions in relation to optimisation of performance of a system. Which quality-characteristic has the steepest loss function, and is hence most critical for management to work on? *[This is another neat link between the first two parts of the System of Profound Knowledge. As previously, refer back to the your work on the Taguchi loss function on and around Day 7 page 22 if you need to.]*

11. Knowledge about the losses that come from unfortunate successive application of random forces or random changes that may individually be unimportant (exemplified in the Experiment with the Funnel).

Examples *[all of Rule 4 of the Funnel]*:

- Worker training worker in succession;
- Executives working with best efforts on policy, but without guidance of Profound Knowledge;
- Committees in industry, education, and government, working without guidance of Profound Knowledge.

12. Enlargement of a committee does not necessarily improve the results of the efforts of the committee. Enlargement of a committee is not a way to acquire Profound Knowledge. *[It certainly seems an unlikely way to improve understanding of variation! In any case, members of small committees are generally more able to “work together”.]*

Corollaries of this theorem are frightening.

[In later writing, Dr Deming remarks on the relevance of this comment to the fundamental plank of democracy: the popular vote. See also pages 16–17 in Deming Speaks to European Executives, BDA Booklet A10.]

13. As a good rule, Profound Knowledge must come from the outside, and by invitation. Profound Knowledge cannot be forced onto anybody. *[Note that this provides a strong link with the final member of the set of Obstacles (Day 7 page 35).]*

[It is interesting that, both here and in The New Economics, this apparently very general point appears at the end of the section on Knowledge of Variation. Maybe this indicates Dr Deming’s feeling that it is in the matter of understanding variation that organisations need the greatest external help. Sadly, they will not get it from conventional statisticians. His final comment in the Knowledge of Variation section in Chapter 4 of The New Economics is “Again, a system can not understand itself. One may learn a lot about ice, yet know very little about water”. E.g. see Preludes page 18.]



Step 3: *DemDim* version

Now read through *DemDim* pages 270–274, revising your earlier comments and adding new points below.

The section of *The New Economics* Chapter 4 relating to Part B is pages 67–69[98–101].
However, there is much more: indeed, all of the book's final four chapters (other than the additional final chapter in the Third Edition) are also immediately relevant.



Step 4:

ACTIVITY 10–b

As in Activity 10–a, but now in connection with Part B: “Some Knowledge of Theory of Variation”.

Incidentally, do not be surprised if, both here and in the similar Activities on Day 11, you find yourself coming up with some of the same thoughts and arguments as in previous Activities from within this project. This is, of course, a further indication of how the four parts of the System of Profound Knowledge are strongly interrelated.

(You may find the short discussion on Appendix pages 39–40 to be helpful.)

POINT 1. **Create constancy of purpose.** *(Day 4 pages 16–17.)*

POINT 2. **Adopt the new philosophy. We are in a new economic age, created in Japan.**
(Day 4 pages 18–19.)

POINT 3. **Eliminate the need for mass inspection as a way to achieve quality.** *(Day 4 pages 20–21.)*

POINT 4. **End the practice of awarding business solely on the basis of price tag.** *(Day 4 pages 22–23.)*



POINT 5. **Improve constantly and for ever the system.** (Day 4 pages 24–25.)

POINT 6. **Institute modern methods of training.** (Day 4 pages 26–27.)

POINT 7. **Adopt and institute leadership aimed at helping people to do a better job.** (Day 5 pages 2–3.)

POINT 8. **Encourage effective two-way communication and other means to drive out fear throughout the organisation.** (Day 5 pages 4–5.)

POINT 9. **Break down barriers between departments and staff areas.** (Day 5 pages 6–7.)



POINT 10. Eliminate the use of slogans, posters, and exhortations. (Day 5 pages 8–9.)

POINT 11. Eliminate work standards that prescribe quotas for the workforce and numerical goals for people in management. (Day 5 pages 10–11.)

POINT 12. Remove the barriers that rob hourly workers, and people in management, of their right to pride of workmanship. (Day 5 pages 12–13.)

POINT 13. Institute a vigorous programme of education, and encourage self-improvement for everyone. (Day 5 pages 14–15.)

POINT 14. Clearly define top management's permanent commitment to ever-improving quality and productivity. (Day 5 pages 16–17.)



DISEASE 1. [The crippling disease is lack of constancy of purpose.](#) (Day 5 pages 18–19.)

DISEASE 2. [Short-term thinking defeats constancy of purpose.](#) (Day 5 pages 20–21.)

DISEASE 3. [The effects of performance appraisal are devastating.](#) (Day 5 pages 22–23.)

DISEASE 4. [Mobility of management causes instability.](#) (Day 5 pages 24–25.)

DISEASE 5. [One cannot be successful on visible figures alone.](#) (Day 5 pages 26–27.)



Congratulations—you're halfway through this important project!

“Out-of-hours” note

As you will remember, the preparation I recommended before you began the Second Project comprised three sections. Two of those sections (on the four-step procedure and on your previous work in the First Project) should now be so familiar to you that you'll need no further preparation on them. That leaves the second of the three sections, which previously only concerned Parts A and B. So, in your remaining preparation for the second half of this project, you will similarly need to spend some time on the relevant material in Balaji's Preludes and in *DemDim* Chapter 18, i.e. those which relate to Parts C and D.

In both cases there are no more than three pages for you in *DemDim* Chapter 18: pages 274–276 and pages 277–279 respectively. In Balaji's Preludes you have pages 15–19 and 20–25. As previously, I suggest you always have Peter Scholtes's diagram from Day 9 page 22 in front of you to keep you focused on a small number of main features and the nature of these two Parts.

So firstly, carefully read through Balaji's Prelude C and then *DemDim* pages 274–276, making notes on where you see the links between them. Prelude C very helpfully and straightforwardly concentrates on a particular aspect of the Theory of Knowledge which otherwise you might possibly have found to be the most challenging. A consequence is, of course, that it does not include anything on some other important issues, but hopefully you will find them adequately covered in *DemDim* and in the course material tomorrow. Nevertheless, the coverage in both *DemDim* Chapter 18 and in Dr Deming's May 1990 version is shorter than with the other three Parts, and so I have included some additional reading tomorrow morning: *DemDim* Chapter 7 on Operational Definitions and Chapter 9 on the Deming Cycle. Therefore, *if* you have the time, you might also like to take a quick advance look at those two chapters. Prelude C does not refer to either of these topics, although in effect the concept of the Deming Cycle is hinted at. If, during tomorrow, you find yourself becoming interested in the important topic of operational definitions then, for your *future* reference, I'll point you toward the excellent Chapter 9 in *Out of the Crisis*.

But don't forget to prepare for Part D as well! So, following the previous pattern, first remind yourself of what's in Prelude D. Then read through *DemDim* pages 277–279, making notes of the links that you see with what Balaji has included in his Prelude. Then you'll be ready to roll!



