

System Dynamics in HR – An Example of Causal Loop Diagrams Used for Discussing a Human Resource -Question

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Annotation:

Causal Loop Diagram (CLD) is one of the fundamental System Dynamics Tools. CLD unique ability is to identify and visually display intricate processes and root causes. An organization is a typical example of a complex system. Every system behaves in a particular manner due to the influences on it. Some of these influences can be changed, some cannot, and some can be minimized. CLD brings out the systematic feedback in processes by showing how variable X affects variable Y and, in turn, how variable Y affects variable Z through a chain of causes and effects. By looking at all the interactions of the variables, the behavior of the entire system is discovered. By using CLD, one does not need to focus only on one interaction between two variables, but can focus on the entire system, along with its many variables and its many causes and effects.

Key words:

Causal Loop Diagram (CLD). System Dynamics. Human Resources.

1 System Dynamics

Methodology and a mathematical modeling technique for framing, understanding and discussing complex issues and problems, system dynamics is an approach to understanding the behavior of complex systems over time (1).

The elements of system dynamics diagrams are feedback, accumulation of flows into stocks and time delays. Use of those elements can be frequently found in Causal Loop Diagrams, in Stocks and Flows Diagrams or in other system dynamic tools. Causal Loop Diagram (CLD) serves not only as representation of the system structure but also for pinning down the system dynamics. It is important that Causal Loop Diagram enables to depict feedbacks, which represent one of the basic concepts of the system dynamic approach. (2)

2 Causal Loop Diagram

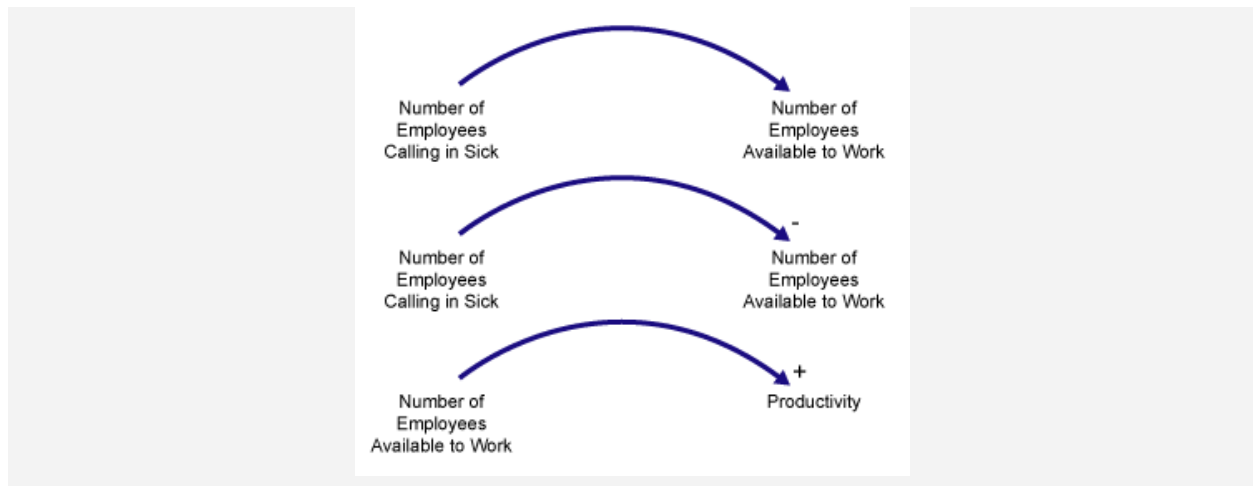
The basic idea of system thinking is that every action triggers a reaction. In system dynamics this reaction is called feedback. There are two types of feedback – reinforcing feedback and balancing feedback. Sometimes a feedback (or a reaction) does not occur immediately – the process contains delays. Any system can be drawn as a diagram set up with circles of causality – including actions, feedbacks and delays. (3)

2.1 CLD use in an economical organization

For general understanding of CLD functioning, we can use an example how CLD could be used in understanding of what is going on in an economic organization. An example was used for Six Sigma black belt training materials. (4)

First, it is important to understand the structure used to create a Causal Loop Diagram. CLDs consist of arrows connecting variables that show how one variable affects and impacts another variable.

Figure 1: Examples of Causal Loop Diagrams



The top example in Figure 1 shows that the number of workers who call in sick affects the number of employees available to work. Additionally, each arrow in a CLD is labeled with a minus or plus sign. The minus sign denotes that the first variable causes a change in the opposite direction in the second variable. In this case, as the number of workers calling in sick increases, the number of employees available to work decreases. The minus sign is placed at the head of the arrow as shown in the middle example in Figure 1.

A plus sign is used to signify that a change in one variable causes the second variable to change in the same direction as shown in the bottom example in Figure 1. Thus, as the number of employees available to work decreases, organizational productivity will also decrease.

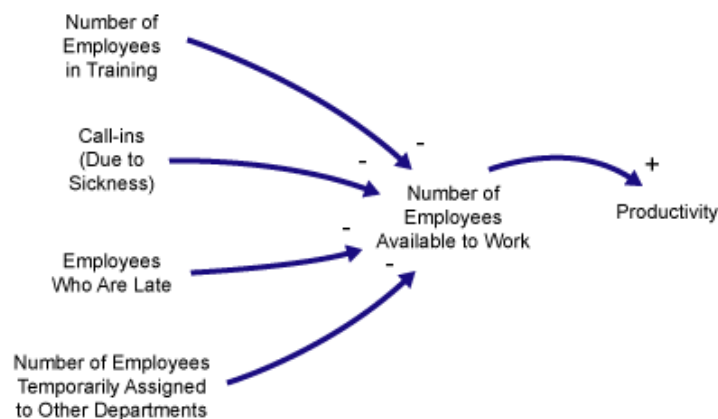
So, when the plant manager says to the resident Black Belt, "Our productivity is decreasing drastically due to all the call-ins we have received from workers who are calling in saying they are sick," a rookie Black Belt might quickly look for ways to increase the health of the plant's employees through wellness programs such as free membership to a health club. Maybe the Black Belt would even suggest setting up a health clinic in the plant staffed by a resident nurse. Both ideas could possibly raise the health of the employees but it could come at a steep price to implement. However, a more experienced hand would opt for a DMAIC improvement project.

During the Define phase, the Black Belt identifies the improvement goals sought by the business and determines that they are consistent with the strategy of the company. During the Measure phase, data would be collected by asking the question, "What affects the number of employees available to work?" By talking to a human resources representative, along with various members of the management team, it can be determined that there are many other factors that cause the number of employees available to work to fluctuate. For example:

- Employees in training (in house and out of the area)
- Call-ins (due to sickness)
- Employees who are late
- Employees who are temporarily assigned to other departments

These variables, once added to the CLD, show a different picture:

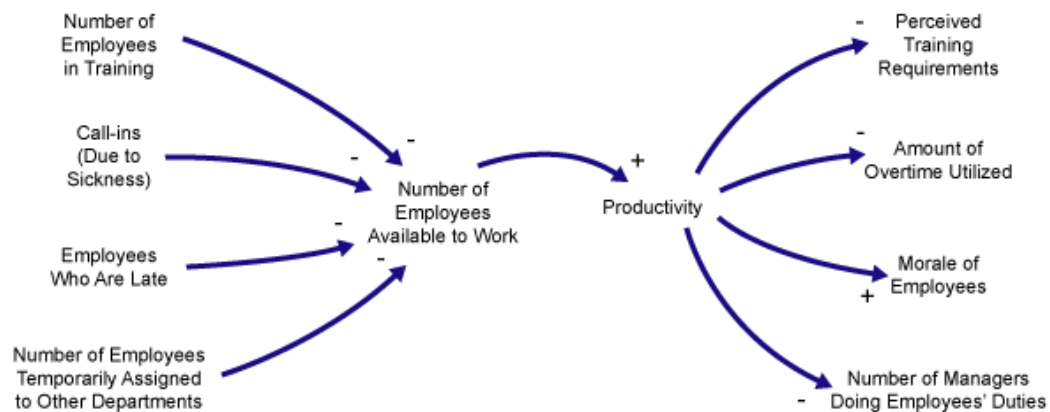
Figure 2: Number of Employees Available to Work



Call-ins (due to sickness) may be drawing a lot of unwanted attention due to the fact some managers may have already had their manpower stretched thin due to other reasons (training, tardiness and temporary assignments).

The question that should be asked regarding the decrease in productivity is simple: “So what?” What are the effects of decreased productivity? Once again through observations, interviews, and document reviews, the answers become apparent:

Figure 3: Effects of Decreased Productivity

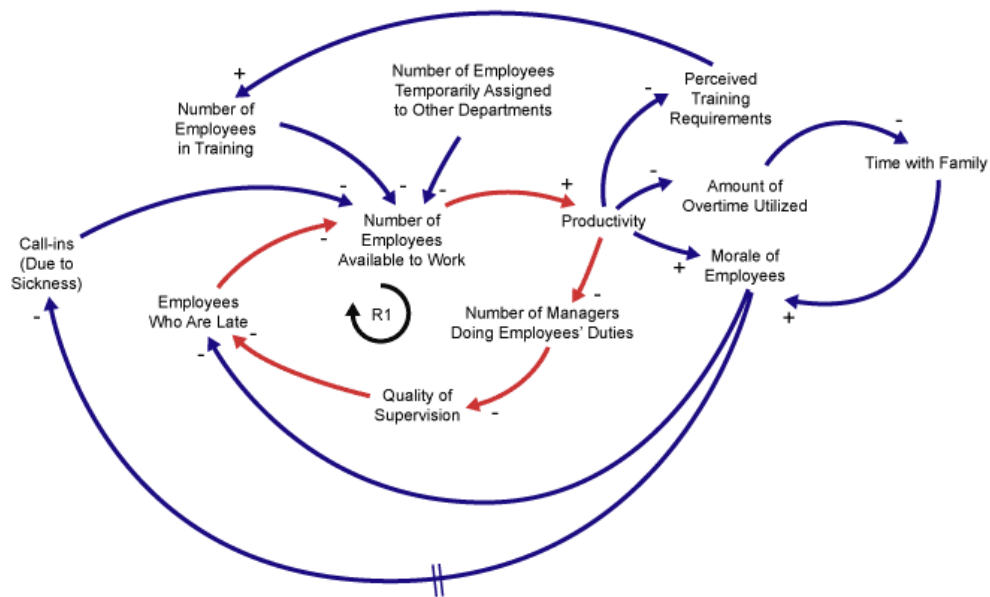


Interesting things are taking place due to the decrease in productivity. First of all, the “perceived” training requirements have increased. This might be due to the mistaken belief that it is the employees’ lack of knowledge that is causing productivity to decrease. Also, to make up for the loss of productivity (due to the limited number of employees), overtime is being used to keep employees at work longer. Morale also is impacted negatively. Majority of all workers want to do a good job. When productivity dips, tensions increase as managers frantically look for the solutions to turn things around. In many cases, this pressure causes morale to dip. Finally, some managers are stepping in to do the work done by those absent employees.

Though well intentioned, the effects of the interventions aimed at improving productivity can be as bad as the initial decrease of able-bodied employees (Figure 4).

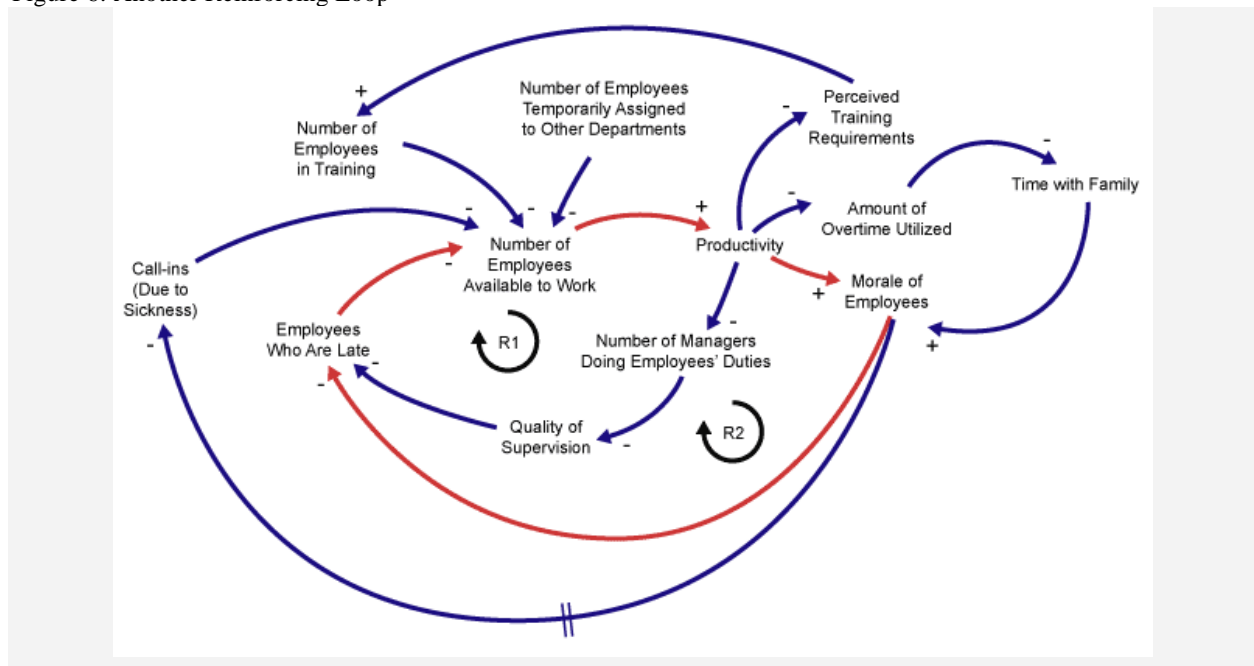
In causal loop diagrams, the arrows come together to form loops, and each loop is labeled with an R or P. P

Figure 5: Labeling the Types of Loops



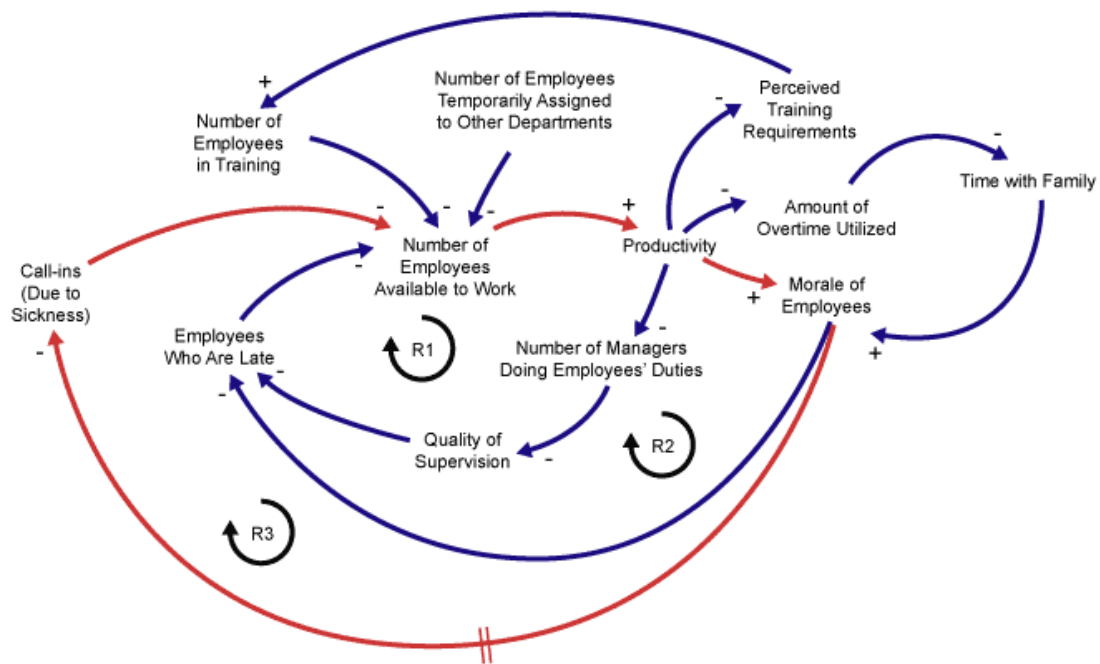
The first loop highlighted in red in Figure 5 is a reinforcing loop (R1). As more managers step into the gap by doing the job of the absent employees, their ability to effectively supervise decreases. Those employees who are not highly motivated (and not very dedicated) take advantage of this lack of supervision and begin showing up late for work. Their tardiness, however slight, causes the number of employees available to work to decrease, which, in turn, negatively impacts productivity.

Figure 6: Another Reinforcing Loop



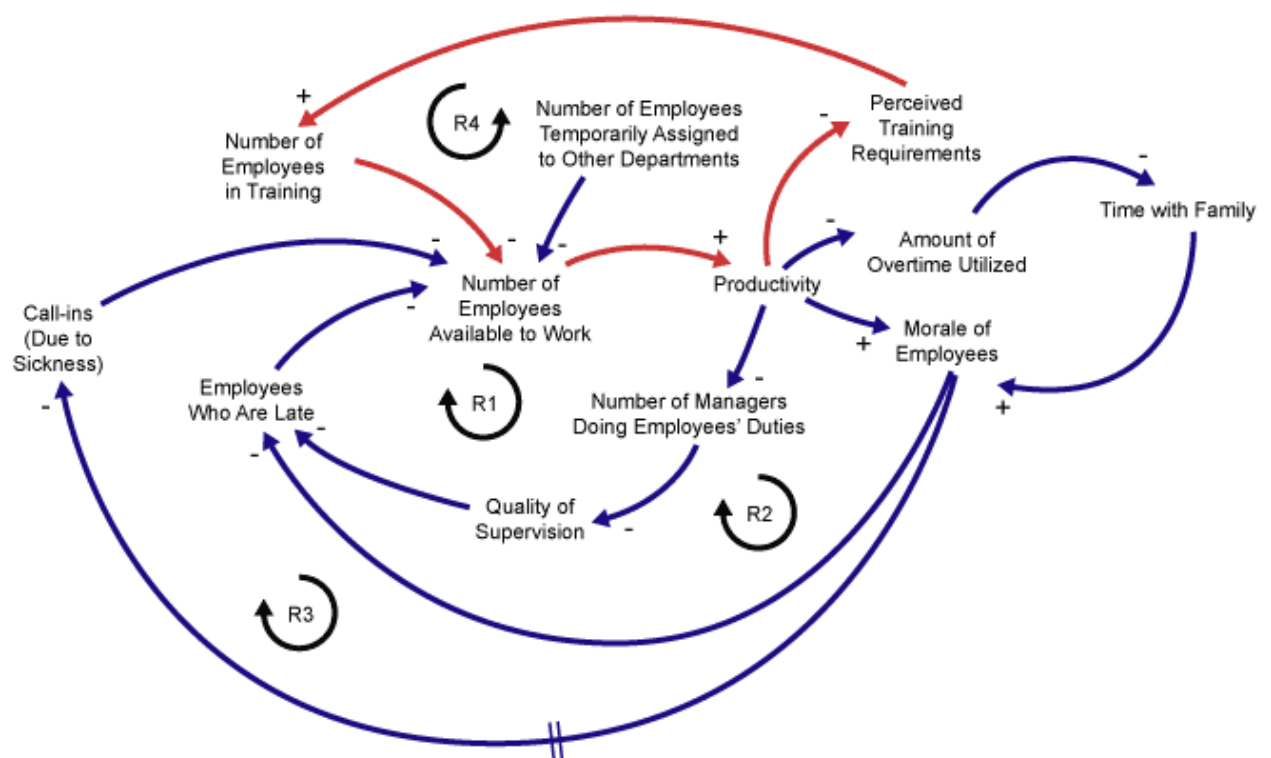
From the expanded CLD in Figure 8, another reinforcing loop (R2) appears. In this case, as productivity and morale both decrease, the number of employees who are late increases.

Figure 7: A Third Reinforcing Loop



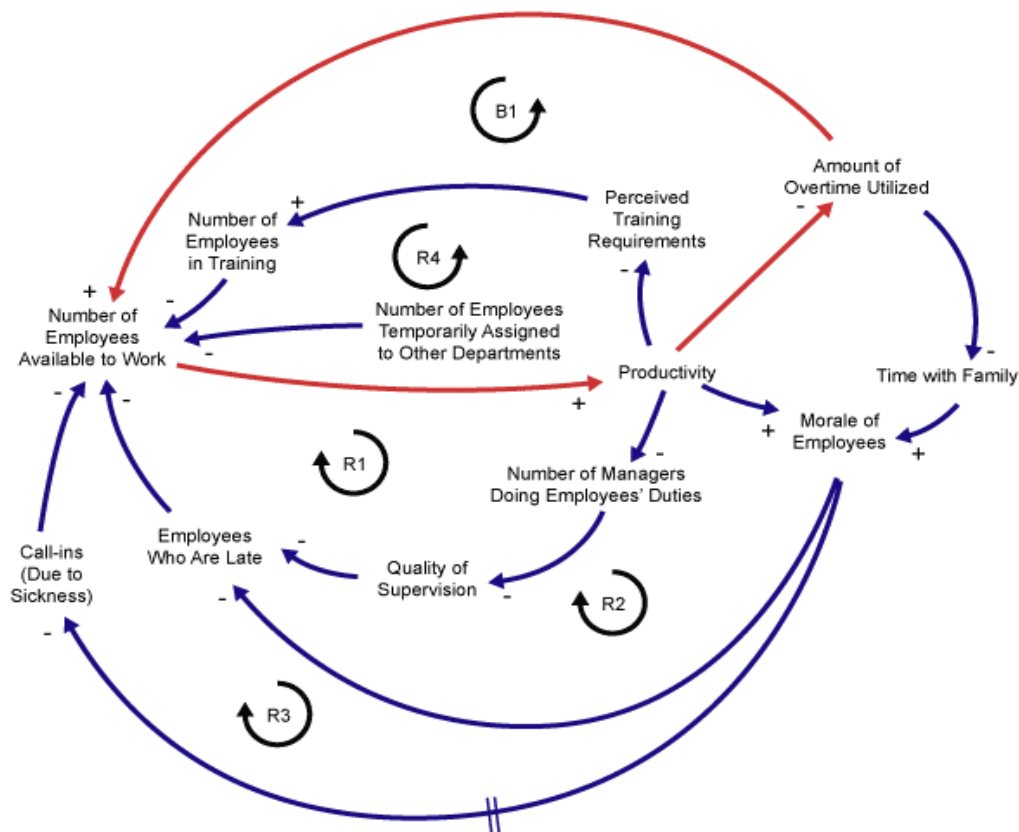
In Figure 9, the next reinforcing loop (R3) shows the effect of long-term depressed morale as the number of call-ins (due to sickness) increases, thereby causing the number of employees available to work to decrease.

Figure 8: A Fourth Reinforcing Loop



In the CLD in Figure 10, another reinforcing loop (R4) shows how an increase in the perceived training requirements (due to decreased productivity) causes more employees to be in training and thus away from work, negatively impacting the number of employees available to work.

Figure 9: A Balancing Loop



The most interesting aspect of this CLD is that this company is using overtime as a method to put this process into balance. The balancing loop (B1) in Figure 11 shows that by increasing the amount of overtime, the company is able to have more employees available to work by basically having them work extra hours, thereby increasing their manpower without adding more people. Though this might work in the short run, it will have severe negative consequences in the near future.

So, by examining this CLD and by looking at the entire system, what could this company do to alleviate the problems? What are some immediate steps a manager or owner could take?

Here are a few ideas:

- Determine if those employees in training (especially those trained locally) can be pulled back early.
- Negotiate with those other departments that have personnel on assignment to see if their assignment length can be shortened.
- Evaluate the training program being attended by employees (both currently and in the future) to determine if it has an impact on the strategy and goals of the company. If the training adds no true value or has little-to-no return on investment, consider canceling it to free up the employees.
- Reinforce human resources policies on tardiness and calling in sick. Remind employees that there are valid steps to follow when calling in sick or late and penalties for abusing these company policies.
- See if other departments can offer up employees on temporary assignment.

3 Conclusion

The above ideas are relatively low in cost, less expensive than a wellness program or an onsite medical clinic. This is the power of the causal loop diagram. It allows to step back and take a system's view of many processes. If properly created, the CLDs are powerful.

Resources

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