Putting UVM on the Assembly Line

Effective UVM Through Integration of Workforce, Planning, and Technology

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Henry Ford showed the world a better way to produce cars in 1913. Since that time, the manufacturing industry has steadily improved upon his methods. Better planning, improved technology, and highly skilled workers have pushed productivity, cost management, and quality control to new limits. How do we apply the valuable lessons learned in manufacturing to an industry that does not work in the controlled environment of a factory setting? Can a well-designed vegetation management (VM) program take queues from the improvements on Ford's assembly line?

A utility VM (UVM) program manufactures a vital part of a greater finished product. That part is a "space" free from the interference of vegetation that allows for the safe, reliable operation of an overhead electric system. This space is a vital part of what the utility needs for their finished product to function properly. The factory floor where this space is created is the service territory itself. Put simply, a mile of overhead line at risk from vegetation enters the factory and a mile of line free from vegetation risk exits the factory. The UVM program is, metaphorically speaking, a line clearance factory in the space-making business.

UVM Factory Assumptions

- It is not cost effective to manufacture more "space" than what the system needs.
- The manufacture of "space" shall be managed to prevent product cost from exceeding the product value.
- The "space" has a finite lifespan and must be replenished to prevent defect in the operation of the power delivery "product."
- If the supply of "space" does not keep up with the demand for "space," the quality of the product will decline or fail. Organizational expenses will go up and inventory of "space" will go down as greater resources are allocated to fixing defective product (i.e., outages, reliability work, hot spotting, responding to customer demands). The price for "space" will go up as will demand for clear "space."

Little's Law I = R ÷ T

I = Inventory (the number of units within the system)
R= Flow Rate (the rate at which the inventory is replenished)
T= Time (the time it takes for the inventory to go through the process)

Example:

Inventory (I) = 20,000 miles of overhead line on a utility system to keep clear of vegetation "space."

The cleared space has a useful life expectancy of four years. So, Time (T) = 4 years.

Flow Rate (R) = 20,000 miles "space" (I) / 4 years (T) = 5,000 miles cleared "space" per year

The resources to clear 5,000 miles must be added to the inventory each year!

To place UVM onto the assembly line, a manager must integrate the workforce, planning, and technology.

The Workforce (Crew)

Skills are acquired with experience and time. Consider, for a moment,

Figure 1: The Clearion solution is an example of a technology that utility managers can integrate into their program. This diagram is courtesy of Clearion Software, LLC

military training as an example where skills ensure survival. Military training involves drilling and the repetition of activities until they become an acquired response. Line clearance workers do not learn the trade from reading. They must experience the work firsthand. A certain amount of time is required before a line clearance worker is well trained and able to recognize and mitigate hazards. It is longer still before they know what to do when encountering a migratory bird nest or how to assess a tree for growth characteristics and risk. Their knowledge becomes more invaluable as they learn the intricacies of a particular system. Skilled workers are difficult to acquire and replace. It behooves the manager to utilize the talents of a worker for the skills they have which cannot be substituted. This is similar to a tool in a factory. The tools are dedicated to certain tasks. Using a certain tool to perform other tasks may not be detrimental to the tool, but it keeps the tool from functioning in its best use. Consider delegating or removing all other tasks the arborist is performing, such as planning or notification, that can be done effectively with another tool. It is imperative the manager has an inventory of tools at his or her disposal and deploys them appropriately.

Planning

The workforce is expected to be productive. Productivity does not equate to efficiency. Efficiency is not necessarily effective. If tree workers are hitting all their productivity numbers, but the productivity is in excess of what is required, this is not efficient. If the productivity includes tasks that can be substituted for a lower cost method, the operation is less than effective. Planners can be used to identify what needs to be produced and determine the proper tool for that portion of the manufacturing process. The batching and timing of work is best managed through a technology solution to ensure the tasks are completed as efficiently as possible and that a surplus of space is not being manufactured. Figure 2 demonstrates some of the processes where planning and technology can be used to improve the line clearance product ("space").

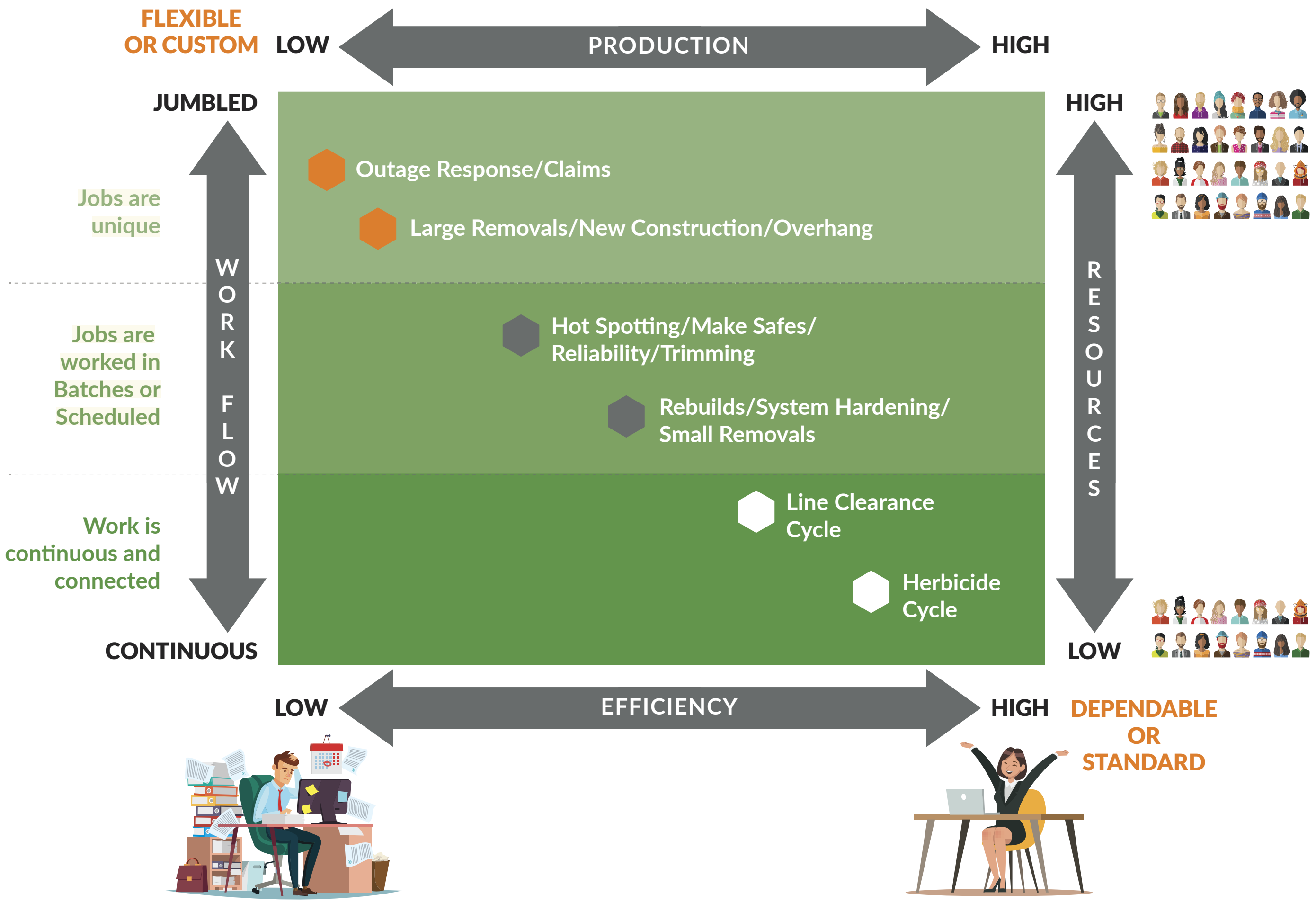
Figure 2 (Below): Hayes/Wheelwright UVM product-process matrix, courtesy of Clearion Software, LLC and CVMC, LLC

Technology

Utility work does not always start at one point and go straight through to another. Powerlines also do not cross areas that are homogeneous. The utility may be subject to regulatory changes, environmental stresses, or new demands from the customer. Although unique tasks cannot be avoided, technology can be used to exploit synergies and batch work. Hardware and software can be used to greatly improve organizational capability. Adding more information is like adding a bigger lever, allowing a manager to exhibit more effective force where it is needed. A higher order of technology allows a manager to add layer after layer of information in an organized fashion, creating a more complete picture and sharing that picture with a wider audience and stakeholders. It also allows managers to integrate information from other sources to focus resources where and when they will have the most impact. The more organized and available the date is, the easier it is to analyze.

Fewer required workers, increased reliability, improved safety, and/or environmental stewardship are all possible. The technology component empowers managers to gauge vital parts of the assembly line: cost, quality, and production. Working with a software solution that understands UVM is recommended to ensure the data and hardware are complementary to the production of "space."

Henry Ford demonstrated high efficiency with low resources with his assembly line. The UVM manager should strive to drive operations to the lower right corner of the matrix. The integration of contract planners and a software solution to track work flow with the workforce is



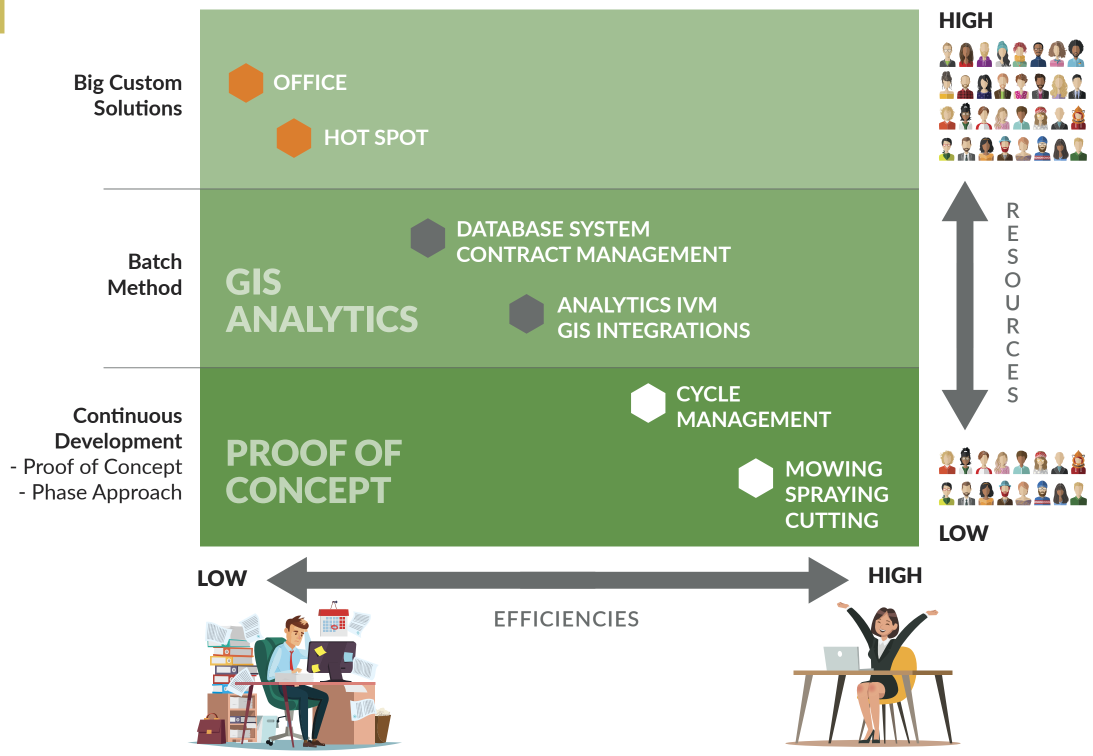


Figure 3: Hayes/ Wheelwright UVM efficiency-process matrix, courtesy of Clearion Software, LLC and CVMC, LLC

essential to finding synergies and batching jobs with similar characteristics, such as proximity to line, geography, accessibility, reliability risk, and environmental issues. Failure to use a higher order of technology is like building one car at a time. Although it provides great flexibility, it is expensive and requires a great deal of resources.

Every utility should put their UVM program on the assembly line. UVM is more effective through integration of workforce, planning, and technology.