Implementing Creative Job Improvements

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Ergonomics practitioners are increasingly being asked to implement job improvements, rather than just give presentations or recommend generic solutions. Making improvements is really the whole point of ergonomics, but is actually less well described in various guidelines and resources than, for example, how to do task evaluations or what should be included in training.

The situation is made harder because many of improvements — especially the most innovative ones — can appear unusual and take some getting used to. The following provides some thoughts based on practical experience in multiple companies and industries.

Part I – Ways to come up with good ideas

Brainstorm

Learning to brainstorm is critical in generating low-cost, effective solutions. Typically, brainstorming works best with a team in a conference room, often using video clips or photos of the job. But it can be done effectively at the site of the problem and by an individual. It's more of a habit than anything.

Learning this habit doesn't happen by itself. You may need to include brainstorming exercises during training sessions and by serving as a role model in how you go about your daily activities. See Appendix, New Rules for Innovation.

20+ ideas

The best ideas often develop after you've come up a large number of ideas, say around 20. That's typically when you start to think of ideas that are both inexpensive and effective. It should be emphasized that the 20 ideas do not need to be feasible and, in fact, can be hare-brained. The goal is to free up your imagination and think beyond the traditional.

In contrast, the normal habit is to only identify 2-3 options and then stop thinking. It's better to force yourself to come up with at least 20 ideas, even if they are not feasible.

As a side comment, it seems that when you pick only 2-3 ideas, it's easy to get locked into one of them and start arguing. On the other hand, a list of 20 ideas can diffuse rigid positions and help keep everyone open-minded. Even if most of those ideas aren't feasible, it reminds people that there may be more ideas yet uncovered and to keep thinking. Knowing that there can be alternatives and adaptations to any particular concept may help keep people from getting too emotionally involved for or against a particular approach.

Cross-fertilize

The value of a fresh set of eyes is well known. You can achieve this by forming teams that involve individuals from other areas of the operation or who would not normally be involved in production improvement.

Likewise, communication between different organizations can yield new ideas, whether the operations are similar or not. Mixing groups of different people can stimulate creativity, in the process known as cross-fertilization of ideas. Even on a grand historical level, it appears that the mix of two societies has led to innovation and growth, e.g. the cultural crossroads of the Fertile Crescent. Isolation can lead to stagnation.

Similarly, excellent sources of ideas are experts in one field who become experts in a new field. They can see things in a different light.

Mull

It can be helpful to reflect on ideas and let them sink in. Research suggests that the brain is most creative when it rests after a period of intense focus. This is the state when connections are made and unexpected insights develop. Most of us have experienced the effect by "sleeping on it" and seeing solutions on a new day.

Mulling can be difficult in action-oriented environments where an immediate fix to a problem is expected. But these expectations don't always meet reality and sometimes can be counter-productive.

Everything you've learned in life

When it comes to brainstorming and getting ideas, you can draw on everything you've learned in life. Solutions don't necessarily have to come from your own industry. You can use techniques and equipment that was developed for completely different purposes.

- Catalogs
    - Various industries
    - Gardening tools
    - Aids for people with disabilities
- Movies, magazines
- Plant tours

Technical knowledge

It may seem self-evident, but for the sake of being complete, the more knowledge you have of the affected technologies, the better. For example, in the field of industrial ergonomics, being well-versed in various mechanisms can be extremely helpful, e.g.: types and functions of levers, gearing, clamps, fasteners, etc.

This is why maintenance personnel and various skilled trades are good to have involved in idea generation. They tend to know these topics, in addition to having the ability to actually implement the solution.

Likewise, it can be helpful to work with your hands, such as with hobbies, home repair, and home workshops. You learn tools, techniques, and methods that can come into play in work settings.

Incidentally, this type of knowledge can also conflict with innovation. If you are well-familiar with a technology, you can become blinded to new ideas. This conflict highlights the importance of cross-fertilization of teams — some members of the team should know the ins and outs of the situation at hand while others provide the fresh set of eyes.

Think antique

Many problems, especially with hand tools, can be resolved inexpensively by using techniques from the 19th Century. Back before electricity was available, many tools incorporated features that reduced physical effort. Examples include:

- Long handles (scythe for harvesting)
- Straps on tools (horse brush, corn husker)
- Compound levers (horseshoe nail puller, leather punch)
- Fixtures (saddle maker's stool)
- Contraptions in general (apple peeler)

So pretend you're a Connecticut Yankee inventor in 1820. Can these simple techniques provide insights to your current problem?

Vendors

Always let vendors know of your needs. A good vendor pays attention and develops products. The catalogs of ergonomics equipment purveyors are filled with items developed because of market needs.

Part II – Ways to implement the concept successfully

Expect set-backs

Doing is much harder than teaching or recommending. Practicing engineers usually know this from experience, but people with no previous involvement may assume that good ideas just fall into place. It can happen, but more often there are frustrating set-backs.

A surprising number of obstacles can pop up:

- You discover you weren't aware of all aspects of the job you're trying to fix.
- New problems are created once you start implementing.
- Commercial equipment you expected to buy is no longer available.
- Materials are incompatible, equipment doesn't fit, capacities aren't sufficient.
- There can be resistance to the change, both organizational and individual.

The list goes on. It can be exasperating, and at times, infuriating. Consequently, you should expect that implementation will involve repeated attempts and a lot of hard work.

Set-backs aren't fatal flaws

Simultaneously, keep in mind that a set-back is not necessarily the end of your project. You simply start brainstorming again to overcome each barrier that you encounter. You learn to persevere.

Thomas Edison was explicit about the process:

- "I go about it, and make trial after trial, until it comes."
- "I have not failed – I have found 10,000 things that do not work."

Trystorm

Trystorming is the follow-up step to brainstorming. You brainstorm in the conference room and then you trystorm on the production floor. In essence, you put together a rough simulation of what you have in mind, usually something makeshift just to experiment. Trystorming allows you to:

- Test an idea to see if it has merit.
- Continue brainstorming with physical items in hand, rather than a sketch on paper.
- Help you understand what you need to figure out.
- Keep the process moving and not die after the initial discussion is over.

Mock-ups and Prototypes

Closely related to trystorming is creating a mock-up and/or a prototype. The differences between these techniques are somewhat blurred, but in general:

- A trystorm is a makeshift test of a concept, as stated above.
- A mockup is generally more substantial, but still temporary – such as a highly adjustable workstation cobbled together to test the best work height for a given task (say by attaching a flat surface to a material handling lift).
- A prototype is a fully-functioning model of the new method, but still rough and made from materials at hand.

Making fine distinctions is not important. The point is to find a way to work the bugs out of a new method before committing to a substantial investment.

Incidentally, many people – production employees and engineers alike – are not used to the idea of a prototype. Their expectation is that the first version they see is what is intended to be the final version. You may need to acquaint them with the process.

Continuous improvement of the prototype

The first design probably won't be the final design. Tweaking and changing are normal.

On-site fabrication of the prototype

In order to tweak and change, it's usually best to fabricate the prototype onsite. Easy contact between the fabricators and the users enables better communication and faster

response. Creating the prototype offsite can be successful, but it's usually harder — sometimes much harder.

Getting good feedback

It's not good enough for a user to say "it doesn't work." For you to determine if the new method is fatally flawed or just involves a setback that you can overcome, you need to know what exactly didn't work. You probably need to say this to the individual.

Furthermore, many people are not used to defining problems this way. The user may need to reflect a while before being able to express the problem. Or the user may know something isn't right, but can't express it. They may say the closest that they can come up with, which might not be very close at all. You may need to spend some time talking with the user — sympathetically and with respect — to dig out the details.

Overcoming resistance

Changing habits and behaviors can be challenging, whether for an individual or for a whole organization. Much has been written on the psychology of change, but here are some thoughts related to changes in work methods.

Discuss in advance

It's good to let people know ahead of time what is in the works. You normally need to explain why the change is coming and that you want their input. This step helps achieve their buy-in, plus it's simply polite and respectful to do so.

Muscle memory

A particular issue for people who have used a certain work method for a period of time is muscle memory. A person can become so accustomed to a certain set of movements that any change can feel awkward, even if it's better.

You probably need to explain this phenomenon to the affected individuals, and then ask them to work with the new method for a time. Sometimes you may need to cajole the individuals one way or another into trying the new method. Of course, you do this with empathy and sincerity.

Some unknowns

Unfortunately, for many ergonomics issues it may be difficult to know whether resistance to change is because of muscle memory or if there's some subtle issue with the job that we don't understand. Perhaps the future will bring us more scientific clarity, but for now there are times when we may wish to tread slowly.

It's not a popularity contest

It's important to ask for feedback, listen, and discuss. But opinions vary and you can't expect unanimity. In the end you — or someone — may need to make a decision.

What you're doing is an informal usability study. In formal studies of this type, we don't expect every respondent to react in the same way. We look for trends and insights to help guide us. The same is true in a production setting.

At the end of the day, it can be a condition of employment that everyone adopts the new method. As a clear cut example, at work people can't just decide for themselves whether or not to wear safety glasses. Around certain hazards, it's required.

The point is that you should expect some variability in how to overcome resistance. Sometimes you can simply encourage acceptance and sometimes you need to be forceful. And there are times when the change isn't as beneficial as intended. The wisdom is in knowing the difference.

Immediate embracement

And fortunately, some changes are great successes that immediately embraced by everyone all around. These are the ones we hope for and try to obtain with a good implementation process.

Understand the task

This seems self-evident, but is worth emphasizing. In my personal experience, a common reason why we experienced setbacks was that I didn't fully understand the task. When possible, it is helpful to do the job to overcome this problem. Alternatively, you can write down the steps of the job as you observe it.

Start with off-the-shelf equipment

When possible, start developing a prototype using off-the-shelf equipment. You may need to do significant modification, but you don't have to start completely from scratch.

Borrow from automation

Sometimes, equipment is available from fully automatic equipment. Engineers may have already developed mechanisms to overcome the actions that are difficult for humans to perform. You can adopt just these mechanisms in your new method. You don't need the whole piece of automation, just some of the mechanisms.

NEW RULES
For Innovation

1. Everyone is expected to come up with ideas for improvement.

2. Raise as many ideas as you can. Whoever thinks of the most ideas wins.

3. Teams identify the best ideas. Two heads are better than one, and 12 heads are better than two.

4. Thou shalt brainstorm. Say whatever crosses your mind. Play off other peoples' ideas. Harebrained ideas are required. Avoid focusing on reasons why an idea won't work, rather keep generating ideas.

5. Watch videotapes of operations. This causes you to focus and you will see things in new light. Do so in a meeting room to permit everyone to be involved and without interruption caused by plant noise.

6. Do not feel discouraged if an idea doesn't make it past the discussion stage. Fewer than one of ten ideas that are raised are actually feasible.

7. Do not expect ideas to work right immediately. Instead, expect that it will take time and usually a bit of trial and error to get something to work right.

8. Understand the difference between (a) a snag, which can be overcome, and (b) a fatal flaw, which totally kills the concept. Do not give up at the first snag.

9. Experiment. If you don't know if something will work or not, test it. Rig up a trial. Build a prototype.

10. It is OK to expect *some* failures. Thomas Edison failed thousands of times at making a light bulb work until he found the right combination of materials.