By Adam Lawver and Sean O'Connor

Deploying Disruptive Technologies with a *Disruptive Approach to Leadership*

Apple. Disney. Lego. These names are well known to us all. But the names of many other organizations could also be added to this list. What they all have in common is that they have "disrupted" their traditional business models and (some would argue) their respective industries by introducing game-changing technologies. They are preparing for the future or, in Simon Sinek's words, "playing the infinite game."

In this sense, "disruption" is not necessarily bad; it can include positive and unprecedented responses to unforeseen circumstances that threaten to undermine business-as-usual. The many articles written about the companies listed above make it clear that at the core of their respective responses has been a commitment to reinvigorate the corporate culture in a way that not only encourages innovation but also—and more importantly—*develops leaders who can foster a higher level of trust within the workforce.*

What often results from this disruptive approach to organizational leadership is a team of forward-thinking leaders capable of responding quickly, especially to unanticipated crises. The hope is that this new type of leadership can avoid the same mistakes that were made in the past, mistakes that today can be more far-reaching and devastating in our rapidly changing culture. In addition, such leadership teams should be flexible and adaptable, prepared for the next crisis that might disrupt the corporate routine yet again. One way or another, new technologies—such as automation, robotics, sensors, communication devices, and exoskeleton suits—will shape how we do what we do. The critical

develop a community of leaders at all levels—leaders capable of planning, of reacting quickly and flexibly, and of promoting operational excellence to match an accelerating pace of disruptive change.

THE CASE OF MICHIGAN STATE UNIVERSITY

Campus Services, a subunit of Infrastructure Planning and Facilities (IPF) at Michigan State University (MSU) responsible for maintaining the university's facilities and grounds, has been aggressively deploying mobile devices, mobile robotics, sensors to inform human behavior, and autonomous-vehicle and mobility-industry technologies to promote a high-performance workplace culture. These new technologies are disruptive in the sense that they are changing the way Campus Services operates, but they are doing so constructively. From this experience, we know firsthand that such rapidly evolving technologies can indeed increase both productivity and volume of business.

Our on-campus operation consists of 780 (full-time, temporary, on-call, and student) employees, 45 of whom serve in some formal leadership/supervisory role. This workforce is deployed

"THE HIGHEST LEVELS OF PERFORMANCE REQUIRE THE DEEPEST LEVELS OF TRUST. AS YOU DEPLOY DISRUPTIVE TECHNOLOGIES, CHANGING THE GAME FOR HOW YOU DO WHAT YOU DO, THEN FOSTERING TRUST BECOMES JUST AS IMPORTANT—OR MORE IMPORTANT—THAN THE TECHNOLOGIES BEING DEPLOYED."

question now becomes how we, as organizational leaders, build levels of trust to foster a workplace climate that inspires and encourages a high-performance workforce flexible enough to respond effectively to unanticipated events.

What immediately comes to mind, of course, is the COVID-19 pandemic and the challenges it has presented (and will continue to present). It has disrupted almost every routine in both our professional and our personal lives, blurring (and sometimes dissolving) the conventional lines that separate the two. Uncertainty is on everyone's mind, and much of life as we once knew it will never be the same. But this crisis also provides an opportunity to "reboot" and to accelerate important and necessary transformations. Organizational leaders who understand the importance of fostering trust within the workplace will be better equipped to "disrupt" their usual business models in the face of a crisis than leaders who do not.

This paper proposes that one of the keys to managing disruption is to invest in the organization's *culture of work*, as well as in the technologies required for progressive change, in order to

in four labor-intensive business areas that help keep the MSU campus clean, sustainable, and safe: 1) Landscape Services, 2) Custodial Services, 3) the Surplus Store and Recycling Center, and 4) Transportation Services. It is critical to note that *70 percent of our business costs are labor expenses*; therefore, optimizing the efficiency and safety of these laborers is extremely important.

As we have navigated the disruptions caused by COVID-19, we have learned (sometimes by our mistakes) two related things:

1. **We must continue focusing on *HOW* to do what we have always done, but also more on *WHY* we do it in the first place.** If there is a good reason (*why*) for continuing to provide a given service, then *how* will we provide it as we move forward, given the rapid and unpredictable changes that are occurring around us? It should be obvious that such an important conversation must include not only our 45 supervisors but also *the entire workforce* deployed across campus at our various points-of-service, thereby creating a community of leaders.

2. **We have had to encourage our team leaders to place more value on the workplace perspectives of those they supervise (i.e., those who follow their lead).** We are gambling that we can better achieve operational excellence if we all work together across the ranks, helping one another—the entire workforce—to achieve a higher level of performance while coping with unanticipated challenges that are sure to arise and that always have the potential to dishearten, if not demoralize the workforce.

What the workplace needs in our disruptive age are leaders who first appreciate not only the workplace needs and desires of those they supervise, but also what these workers, in turn, expect of them and of the leadership and direction they provide. Perhaps the greatest resource an organization has is the invisible fabric of interwoven relationships between supervisors and laborers—a fabric of trust. How an organization creates, fosters, and rewards trust will directly impact the level of workplace performance.

DEPLOYING DISRUPTIVE TECHNOLOGY

The following six sections describe or envision the deployment of six disruptive technologies related to MSU's Campus Services operations. Each section includes a brief description of the relevant business concept and a discussion of the new approach to leadership necessary for the successful utilization of that technology. We also discuss the challenges and opportunities that arise as the organization becomes increasingly competent in using that technology—in other words, as the technology matures from its initial ("experimental") stage of application, to a more sophisticated stage of development, to a final stage where it is more completely integrated into the operations of the entire organization.

1. Handheld Mobile Devices

Business Concept. Today, and for the foreseeable future, the workforce must be equipped with access to information out in the field where critical decisions are made. It is therefore essential to provide mobile devices as a platform for improving access to that information. Technology systems can then be aligned to establish an "information ecosystem" not only to manage data gleaned in the field but also to track operational metrics and to plan future operational strategy.

The MSU Story. These links each provide a visual display of how handheld devices have radically improved the way Campus Services and IPF operates: (*See Displays 1 and 2).*

Approach to Leadership. The financial crises of 2008 resulted in a 10 percent reduction in the general fund of our Landscape Services department. It never fully recovered, and by 2012 many of our funding accounts were operating in the red, and a few customers were considering outsourcing our services. Levels of trust, morale, and optimism were at an all-time low. Leaders

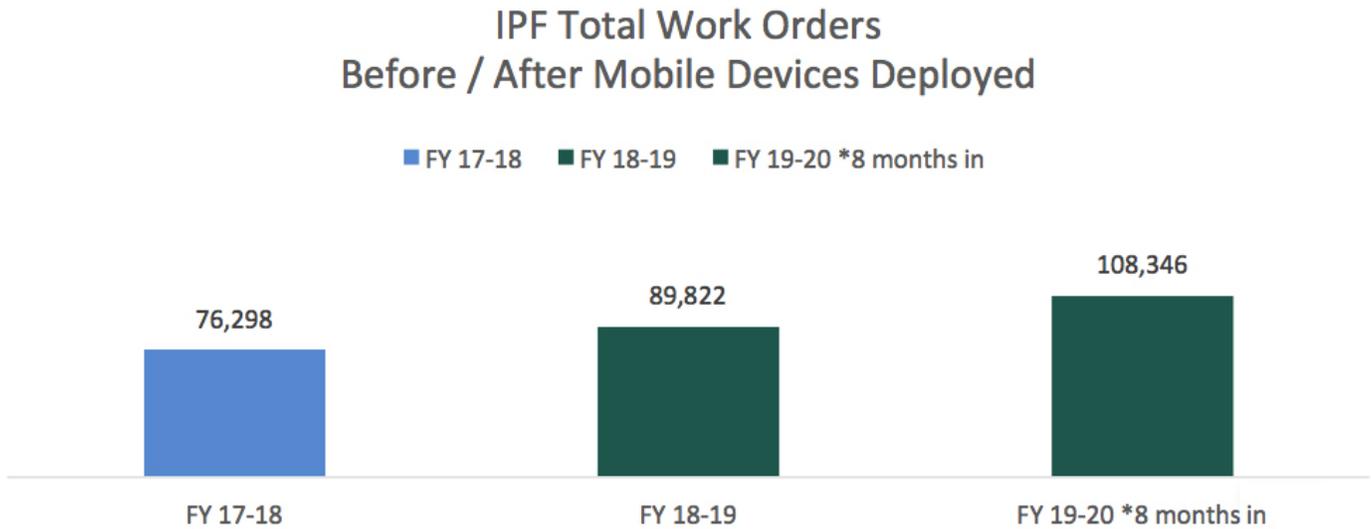Display 1 - Landscape Services using mobile devices in 2016.
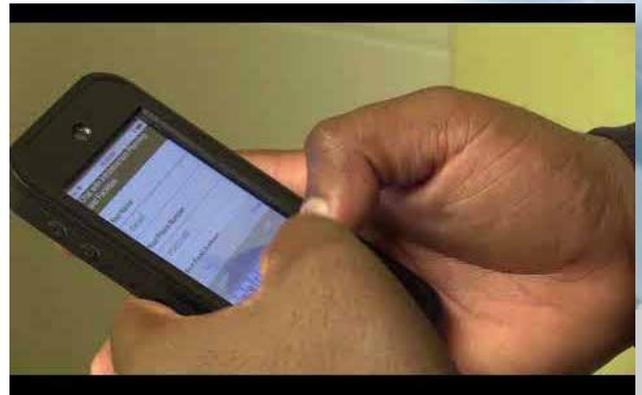
Display 2 - Custodial Services using mobile devices in 2018.

began changing the business out of desperation, focusing on creating alignment through a department mission and strategic plan, and changing many approaches to leadership.

One problem we identified was our lack of inclusion when it came to information-sharing, decision-making, and access to other functions (e.g., participation in advertised "all-staff meetings," access to minutes of meetings, neglect of weekly one-on-one "check-in" meetings with each employee, distribution of cellphones). With the advent of the smartphone, we considered how we might use it as a platform to help increase access to information, empowering our work crews out in the field to make better-informed decisions. Unfortunately, very few of our employees owned smartphones, and none had been provided with a work device that could make cellular calls or access the Internet. This resulted in greatly reduced information-sharing, and anxiety intensified as more technologies were introduced to the workplace. This lack of information-sharing was creating fear, fueling rumors, and ultimately breeding mistrust.

In response, we decided to purchase iPhones and iPads, allowing our workers to decide which device size best helped them perform their assigned tasks successfully and efficiently. We trusted employees to take these devices home each day and to enjoy their personal use, so long as they adhered to university and workplace policies. We also designed the application of

Figure 1: IPF Work Order Data

IPF Total Work Orders
Before / After Mobile Devices Deployed

■ FY 17-18   ■ FY 18-19   ■ FY 19-20 *8 months in

76,298	89,822	108,346
FY 17-18	FY 18-19	FY 19-20 *8 months in

these mobile devices to take advantage of our multigenerational work crews, assigning younger and more tech-savvy employees to serve as crew "champions" to help (and teach) those who were less experienced with new technologies.

The opportunity we had in this situation—often missed in most organizations—was to ensure that these technologies were deployed in an inclusive way, so that information-sharing could proceed *up* as well as down the hierarchical chain-of-command. We wanted to ensure that each employee's input went into the creation and utilization of these tools. We met some resistance from outside the organization, with understandable concerns that devices would be broken or misused. Fortunately, this has not occurred. In fact, we have observed just the opposite.

By allowing our staff to take their devices home, these tools became an extension of their livelihood, which is what well-used *and cared-for* tools should be. We significantly increased staff buy-in and sense of ownership not only of the tools but also of our overall mission, and workers became increasingly proficient in their use of the technology. Thanks to this approach, we were able to rebuild trust within our workplace culture.

In 2018, IPF deployed mobile devices to *all* its staff, modifying and adjusting many business processes as a result. We tracked the total number of work orders completed before and after these mobile devices were deployed, and we discovered that the total volume of completed work orders increased by 15 percent in FY 2018–19 and by 17 percent during the first eight months of FY 2019–20. Interestingly, the total workforce employed remained the same during this time. (See Figure 1.)

By deploying mobile platforms to increase the access of information critical to daily decision-making, we have expanded

the community of workforce leaders who are now trusted and empowered to improve how we do what we do. As a result, we have not only improved our workplace culture but also remained competitive in the industry.

2. MOBILE ROBOTICS

Business Concept. As we move into the future, mobile robotic devices can be deployed to augment our workforce capacity, playing an increasingly vital role by performing such routine tasks as mowing lawns, removing snow, and cleaning floors. This allows us to reallocate our existing labor force to provide new services, increasing value to the university. For example, we can deploy an autonomous, battery-powered fleet of robotic lawn mowers to work at night, no longer interfering with daytime teaching and research. Or we can deploy a fleet of robotic floor cleaners to operate at night, allowing us to reassign the number of third-shift (nighttime) custodians to the first or second shifts, thereby reducing the health and safety risks associated with this so-called "graveyard" shift[1] and, consequently, improving efficiency.

The MSU Story. This link provides a visual display of how mobile robotics have radically improved the way Campus Services operates: (*See Display 3*).

Approach to Leadership. At the intersection of repetitive, routine tasks and increasing pressures (especially on labor-intensive businesses) to contain or reduce costs, are robotic machines that enhance workforce capacity through improved efficiency and safety. We have involved our staff in designing the processes and steps we must take to incorporate this technology into our overall operation. Students, temporary workers, and full-time

Display 3 - Overview of landscape and custodial robotic use.

employees worked together with staff leaders to determine the best ways to incorporate and utilize this new technology. Employees acquire an expanded set of skills when deploying robotic devices to tasks once performed by manual labor. Christopher Creel refers to this as "outsourcing inhumane work."[2]

3. OPERATIONAL "DASHBOARDS"

Business Concept. Operational dashboards visually display the progress our work crews are making toward monthly and yearly goals. The opportunity to display and exchange such information (metrics related to tasks completed) helps build trust among teams, increases morale, fosters mutual respect between the workforce and supervisory leaders, and inspires pride and accountability as everyone sees that their respective and combined tasks are all moving forward.

The MSU Story. This link provides a visual display of how these dashboards have radically improved the way Campus Services at MSU operates: (*See Display 4*).

Approach to Leadership. The manufacturing industry has shown us that, by posting the number of widgets made by first-shift workers, second- and third-shift workers become better motivated to meet their respective quotas (i.e., healthy competition). This can be transferred to the nonmanufacturing sector,


Display 4 - Landscape Services Operational Dashboards (2019).

inspiring us (for example) to publicly post our landscape services metrics. One happy and hoped-for consequence of this was to break down tensions and animosities between work crews who often believed that some crews were slacking off while others were doing most of the work. Publicly displaying daily "work-completed" data actually increased mutual respect and a shared understanding of how each crew and employee is part of the larger operation, working together to achieve larger corporate goals. This alignment is what every good leader should hope to achieve, and publicly displaying crew-specific metrics aligned with respect to larger organizational metrics helps to move us more decisively in that direction.

4. INTEROPERABILITY

Business Concept. Interoperability is the ability of computer systems or software to exchange and make use of information. In August 2004, the National Institute of Standards and Technology (NIST) published an article[3] providing quantified measures of the lack of interoperability of information technologies in the capital facilities industry, which hampers that industry's ability to integrate design, construction, and operational processes. Incorporating interoperability in the workplace enables a more intentional focus on how best to optimize every hour of work performed there.

The MSU Story. Interoperability is not yet a part of the MSU "story," but it is clearly looming on the near horizon. This link provides a brief, visual display of the ways in which interoperability (e.g., of geographic information systems and integrated work management systems) can be deployed to manage facilities more efficiently: (*See Display 5*).
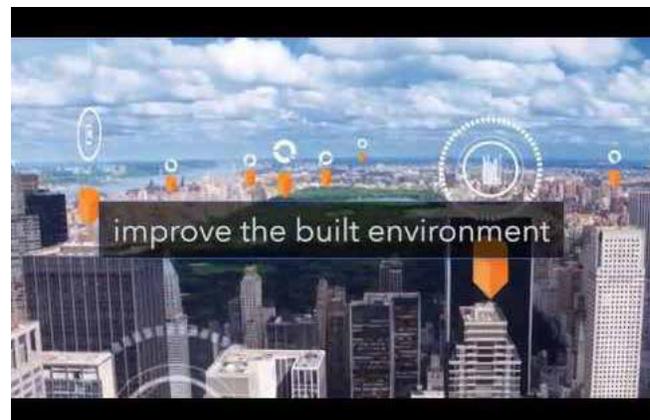
Display 5 - ArcGIS Indorrs Marketing Video.

Approach to Leadership. In 2019, IPF began a three-year project to map all assets within the facilities it maintains. The purpose was to identify both the physical location (geospatially within the building, floor, room, and location within the room) and the current condition of those assets, as well as any associated work records maintained in the university's Integrated Work Management System (IWMS). IPF maintains approximately 24.5

Figure 1: IPF Building Asset Mapping

million gross sq. ft. of space on campus. "Assets" fall into such categories as HVAC, electrical, electronic, plumbing, telecommunications, fire suppression, etc. (See Figure 2.)

The NIST study notes that the *lack* of interoperability of information technologies results in approximately $0.33 per square foot (in labor, supplies, etc.) being *wasted* because the workforce does not have efficient access to information critical to daily decision-making. For MSU, this translates to almost $8 million wasted each year that we could recapture in workforce efficiency, accomplishing even more work with the same-sized workforce.

For years this opportunity has been largely ignored in our industry; but the new technologies being developed will enable leaders with vision to better equip their workforce with access to this type of information, putting them at the forefront of recovering efficiencies that had been lost due to lack of access and interoperability of information systems. More importantly, employees who are empowered with this level of information pertaining to their specific jobs will acquire a sense of ownership and confidence in mastering their specific crafts—not just "making repairs" but mastering asset diagnostics, essentially becoming stewards of MSU's critical asset infrastructure.

5. EXOSKELETON SUITS

Business Concept. It is exciting to imagine how exoskeleton technology can improve the safety and productivity of work crews out in the field. For example, landscape professionals who are installing retaining walls or moving pallets of materials into tight, confined spaces no longer need to strain with heavy objects or request backup workers for assistance. Instead of dispatching a trailer, a forklift vehicle, or a skid-steer loader to a

job site to move heavy objects (e.g., balled-and-burlapped trees, boulders, palleted supplies), a worker can put on an exoskeleton suit that will literally do the heavy lifting. The possibility of dramatically reducing landscape-related injuries (from lifting and twisting) is unprecedented. But this is only the tip of the iceberg: Other industries on campus can benefit from this technology, especially those that involve lifting, drilling, and overhead work (where muscle fatigue can set in rather quickly, leading to loss in productivity and potential injuries).

The MSU Story. Exoskeleton suits have not yet become part of the MSU "story," but they, too, are clearly looming on the near horizon. These links each provide a visual introduction to the ways in which these suits can be deployed to increase the efficiency and productivity of the work we do: (*See Displays 6 and 7).*

Approach to Leadership. At the 2020 CES (Consumer Electronics Show) international trade show, Delta Airlines announced a partnership with Sarcos Robotics to deploy exoskeleton suits with their baggage-handling crews to improve efficiency and to reduce fatigue and workplace injuries. NBC News published an article[4] describing various uses of this technology. We need to be thinking now how we can acquire and deploy this technology into our business models to disrupt the negative cycle of workplace injuries resulting from physically demanding jobs.

Using this technology does more than show the workforce how serious the organization is about addressing workplace injuries. It also signals its commitment to creating access to more career pathways. In labor-intensive industries with heavy-lifting requirements, this technology is literally a game-changer. This is

Display 6 - Delta Partnership with Sarcos Robotics.

Display 7 - Various Uses of Exoskeleton Suits.

most exciting for people who previously did not consider a labor-intensive career track because of concerns about meeting lifting requirements.

This technology opens up doors for these people to work in a particular industry and not be concerned with physical limitations that may have discouraged them in the past. And for older employees, this technology could extend their employment in that industry by another 5, 10, or even 15 years, lowering the number of those who either go out on disability or require other workplace accommodations. A multigenerational workforce in this industry also provides opportunities for older employees with lots of institutional knowledge to mentor new ones into the workplace culture. The organization also benefits by financial savings from fewer on-the-job injuries that result in loss of productivity.

## 6. A Smart Campus Operations Center

Business Concept. The opportunity exists to link multiple around-the-clock functions—building controls and automation, autonomous vehicles/shuttles, mobile robots—into one "smart" campus hub. In this centralized location, all these various functions can be constantly monitored and analyzed across the entire campus (indeed, across an entire city!), allowing appropriate intervention when necessary.

The MSU Story. Figure 3 provides a picture of what a Smart Campus Operations Center on the MSU campus might look like.

Approach to Leadership. In the future, world-class university campuses will require a sophisticated integration of systems, services, and data so that their operations can proceed efficiently and safely. There will always be a need to improve our support

Figure 3: A Typical Smart Campus Operation Center, rendering by FTCH and IPF
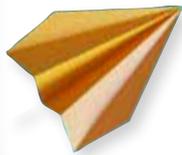
functions and to accelerate academic design and research in the fields of mobility, automation, robotics, and information management. Imagine the strategic alignment of such things as building-automation control systems, traffic systems, autonomous vehicles, and robotic fleet management systems, all gathered together in one centralized facility where these (and other) technology systems can be constantly monitored and integrated with the pool of available human workers.

For example, as autonomous vehicles and mobile robotics begin to increase in number and sophistication, the need will also arise to monitor, control, and process the large data sets that just these two technologies alone will generate. A center such as this will be cutting edge, perhaps even spawning new technologies. IoT (Internet of Things), cybersecurity for interconnected autonomous vehicles, robotics, and building-automation systems will soon become areas of operations management and research where MSU can position itself as a leader. In addition, MSU provides a unique, attractive campus infrastructure where outside vendors and partners can help leverage the university's assets for research and development.

The way in which designated leaders draw employees and work crews into the planning and efficient functioning of such a centralized operations center will be critical to its success. Because a high level of trust is essential throughout the workplace, all employees need to realize that these new technologies may require new training to provide teams of technicians with the skills and abilities to operate such a facility and to connect the various technologies synergistically across the campus.

A facility like this will also require us to cast aside the old "silo mentality," leveraging the strengths of individuals and departments while dismantling the territorial lines traditionally drawn not only between the university's support side and its academic side but also between the institution itself and those outside of it. There will be a larger number of more diverse stakeholders in this unprecedented kind of operation.

For many, all of this can be a frightening prospect. If nothing else, the past has taught us that when something radically new occurs, fear of the unknown creeps into the conversation and soon threatens to overwhelm it. How leaders address this fear with the rank-and-file will be extremely important. If managed well, the impacts can be far-reaching and "disruptive" in a positive sense to how we have always operated a campus. The goal, of course, is to promote improvements to safety, to energy use in facilities, and to the overall experience of campus life at Michigan State University.

Automation, robotics, sensors, exoskeleton suits, and other new technologies will continue to impact how we operate. They will truly disrupt the old routines. It is doubtful that our current approaches, patterns, and routines of leading the workforce will be adequate to the task—they must also be disrupted.

As leaders, the relationships we build and the levels of trust we create within the workforce—as we focus on the needs of our employees—will go a long way toward building and nurturing a work environment that can not only withstand the unanticipated challenges that will surely arise in the future, but can also move our operation to an even higher level of performance.

ENDNOTES
1. Michael L. Lee et al., "High Risk of Near-Crash Driving Events Following Night-Shift Work," *Proceedings of the National Academy of Sciences of the United States of America* (January 2016), https://www.ncbi.nlm.nih.ogv/pmc/articles/PMC4711869/ (accessed April 30, 2020).
2. Christopher Creel, *Adaptive: Scaling Empathy and Trust to Create Workplace Nirvana* (Lioncrest Publishing, 2019). See https://www.authorhour.co/adaptive-christopher-creel/ (accessed April 30, 2020).
3. Michael P. Gallaher et al., *Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry*, National Institutes of Standards and Technology, NIST GCR 04-867 (August 2004), https://nvlpubs.nist.gov/nistpubs/gcr/2004/NIST.GCR.04-867.pdf (accessed April 30, 2020).
4. Steven Ashley, "Robotic Exoskeletons Are Changing Lives in Surprising Ways," *Mach* (February 21, 2017), https://www.nbcnews.com/mach/innovation/robotic-exoskeletons-are-changing-lives-surprising-ways-n722676 (accessed April 30, 2020).

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