Management and Human Resources Management Task Force

Phase II Report of the MaCuDE project[1]

The Effects of Digital Technologies on Work and the Workplace

Task Force Members

Tom Begley, Professor, Lally School of Management, Rensselaer Polytechnic Institute and Head, MaCuDE Management Task Force
Peter Dominick, Professor, School of Business, Stevens Institute
Dimitra Iordanoglou, Assistant Professor, Panteion University
Theano Lianidou, School of Business, Stevens Institute
Marc Marchese, Professor, King's College
Alexander Mertes, Lecturer, School of Management and Law, ZHAW
Gregory Prastacos, Dean, School of Business, Stevens Institute

With invaluable assistance from Elizabeth Gomez, Project Manager, MaCuDE

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MaCuDE
Management Curriculum for the Digital Era

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1) Introduction

Executive summary

As the MaCuDE task force responsible for investigating the effects of digitalization on the discipline of management, we conducted 62 interviews with executives and managers in private sector companies, seeking to better understand how it is affecting managerial life. We used the transcripts from these interviews as our main sources of data.

To set the stage and provide concrete examples of how digital technologies are being applied in our respondent companies, we begin this report with a host of instances that illustrate digitalization at work. Then we move into the major topics in our analysis. First, we explore the three digital technologies that are being applied most visibly in management: automation, data analytics, and the cloud. Analysis of the reasons for their prominence leads us to conclude that 1) jobs that can be automated will be, 2) data is the main currency of the digital economy and its analysis provides a key input into decision making, and 3) the cloud has made digitized material readily available regardless of geographic location and has centralized the IT function.

When we examine the impact of digital technologies on the workplace, we see their effects most clearly on the customer experience, efficiency, metrics and measurement, the pace of change, and change management. Vast amounts of data on customers has induced increased attention toward improving the customer experience. The ongoing drive for efficiencies has encouraged the use of digital tools to eliminate positions that do repetitive work. The use of metrics and measurement are facilitated by the delivery of "real time" data. The pace of change has accelerated, bringing the need for skills in change management to the fore. At the same time, while digital is receiving much attention in industry, its effects have not yet become pervasive in many companies.

Digital technologies have generated a need for new ways of working that require a specific set of skills. Teams have become central to organizational life. Accessibility of data has produced increased transparency and accountability, faster response times, greater visibility of who is producing, and greater ease in working across geographies and functions. On the other hand, it has led to information overload, added complexity to decision making, and generated the anxiety and stress that accompany rapid change. A widespread belief that early adopters of digital technologies gain competitive advantage has increased the urgency of using them.

While respondents do not seem to view ethics as problematic, their concerns are mainly about data privacy, cybersecurity, and job loss from automation. They welcomed the opportunity to cite skills new graduates need in the workplace. While acknowledging their digital savvy, respondents were troubled by an inability of new grads to turn the results of analyzed data into a compelling story line. They emphasized the critical importance of "soft skills" (which we will call "interpersonal skills" as a more accurate term), including teamwork, agility, and emotional intelligence, along with a solid grounding in quantitative tools. Leaders need higher levels of the these skills and sufficient familiarity with digital tools to know what they can do. They also need business acumen, sensitivity to social issues, and the ability to manage remotely.

Our interviewees were less expansive about how business schools should prepare students for the workforce. They focused on quantitative skills, the experience gained from exposure to practice through internships, company projects, and other contacts with companies, and an overall attitude represented by the concept of a "digital mindset." Finally, conducting data collection during the pandemic, we asked about its effects on their work. Two mentioned were the constant availability and longer work hours that seemed to accompany working from home and the need to delve further into the personal lives of their employees, given the stresses many of them have suffered. Post-pandemic, they expect hybrid office-home arrangements and reduced travel to endure along with knowing how to use digital communication tools and the ever-increasing need for agility and resilience.

2) Impact of Digital Technologies on the Discipline of Management

As the MaCuDE task force on the discipline of management, we investigated the effects of digitalization on work and the workplace, seeking to better understand the extent of its integration into managerial life, its impact, and the skills needed to manage it. We interviewed 62 executives and managers in private sector companies using a semi-structured protocol with open-ended questions to insured that all interviewers covered the same territory while allowing room for individualized responses. The transcripts from these interviews served as the basis for our data analysis and resulting conclusions. In the following sections, we first present a number of examples of the application of digital technologies then tackle the findings of our interviews, which revealed the main ones affecting management, their impact on the workforce and workplace, ethical concerns, the skills new graduates need to succeed, and how business schools can provide them. Finally, given the prominence of the pandemic during our interviews, we examined its impact on the use of digital technologies.

2a) Examples of How Digital Technologies Are Being Applied

Examples were sprinkled through the interviews of how digital technologies are being applied in business. To quickly place concrete examples in readers' minds, we begin this report with a sampling of current uses in industry. They fall into categories related to efficiencies, monitoring, decision making, and societal contributions. Two themes that appears frequently are: 1) removing humans as the source of data gathering and 2) reducing or eliminating human impact on a) decision making and b) decision implementation. At the least, digital technologies have reduced the need for human intervention at lower levels in companies. A host of examples from our interviews are presented below.

Efficiencies

- Streamlining a process where operational staff sitting in front of terminals need to switch among three or four apps, none of which talk to each other, to complete a client transaction
- Computerizing a manual file sharing process that requires human resources and finance to pass a headcount spreadsheet back and forth every month for review
- Re-engineering wire transfers tied to client transactions to automate the multiple reconciliations needed
- Automating a process to compile monthly reports for an asset management company thereby reducing turnaround time from two days to two hours
- A production floor where robots, previously big, clumsy, and dangerous, have advanced to a level where they are now utilized in smarter and safer ways that have a much smaller footprint than humans
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- Providing automated self-service for employees to handle lower-level human resources tasks like questions regarding PTO, health care coverage, and payroll

Monitoring

- Tracking the functioning of an oil field in Russia or Angola from a desktop in Houston
- A system to monitor and report to a single location the performance of every company compressor worldwide
- Setting up a control room hundreds of miles from an oil drilling platform to reduce risk to life from on-site accidents. When problems surface, trouble shooting remotely in real-time. Using remotely-operated vehicles to conduct underwater inspections
- Using drones to inspect potential problems on communications towers rather than relying on employees hanging from girders
- Employing digital sensors to monitor and analyze data from manufacturing equipment to understand causes and rates of failure, leading to highly accurate predictive analytics for maintenance and productivity improvements
- Utilizing sensors for inventory management to monitor the location of supplies and equipment
- Digital assistants that remind salespeople to check in with particular clients periodically or because these clients are the most likely to respond positively to a recent change in product pricing
- Using sensors to monitor activity of employees working remotely via counting keystrokes or mouse movements

Decision making

- Optimizing shipping decisions by using an algorithm to balance factors like options for mode and price of transport, expected delivery dates, and anticipated demand
- Substituting algorithms for human decision making in asset management because beta testing indicates that algorithmic decisions generate higher profits than human-made ones – by taking many more factors into account simultaneously, making many more decisions more quickly, and at lower operating costs
- Using AI to process data too complex for humans to analyze and at a decision making speeds that could not previously be achieved, delivering previously unattainable performance levels
- Taking advantage of data set interoperability to quickly answer a question that previously required an analyst to take two days to organize and analyze disparate data sets from multiple non-linked sources

Societal contributions

- Applying data analytics to sift through massive amounts of data from forum postings and marketing material to graph social networks of criminals to help law enforcement personnel combat human trafficking and child abuse
- Using the speed of algorithmic detection to identify potential fraudulent transactions at the moment they occur rather than in later account reconciliations
- A health insurer reducing a major source of morbidity and mortality by comparing patients' medication records with their hospital discharge plans to identify discrepancies that reduce medication errors

- Pharmaceutical company R&D functions using digital processing to rapidly evaluate catalogues of products and substances in search of ones holding the best potential efficacy as Covid vaccines
- Using sensors to track each step in the movement of a food product from farm to store shelf so that harmful batches can be traced back to the farm and used to alert all stores that received product from these batches

2b) Impact of Digital Technologies on Management

Three technologies emerged from our interviews as having the greatest impact on management: automation – and the algorithms that make it possible, data analytics, and the cloud.

Automation: As our interviewees clearly indicated, jobs that can be automated will be. Automation and efficiencies complement each other in their mutual focus on automation of processes. Such automation requires those doing the transformation to minutely examine the processes under study to design a system that functions accurately at each stage, otherwise the automation will be ineffective. By digitizing processes, managers can mitigate risk by eliminating the inevitable errors humans make in their work.

The use of bots increasingly dominates call centers. Now, the goal is that bots handle 99% of routine questions with pre-programmed answers while humans handle only exceptions, unique situations, and complex issues. Amazon is the most prominent model driving use of algorithms because a visit to its website offers a seamless experience. One respondent observed that this seamlessness creates annoyance in users if they have to talk to someone.

Two kinds of automation surfaced. With “dumb” automation, the algorithm stays constant in guiding the process. Changing it requires that a human intervene to alter the program. With “smart” automation, machine learning provides the opportunity to improve the process as each piece of data is applied to discover and automatically alter patterns without human intervention. The primary use of “dumb” automation is gradually shifting in favor of “smart” automation as company technical personnel become more familiar with and comfortable with the capabilities of artificial intelligence.

Data analytics: Data is often referred to as the key driver, the main currency, in the digital economy. Data is abundant and the costs of generating, storing, and analyzing it are very modest. As a result of applying data analytics, many executives now have reports available on key metrics on a real-time basis. Several respondents noted that data can serve as a major asset for companies, but if it is not used in the right way, the resulting business decisions are suspect. Competition is not based on seeking data – it is readily at hand – it is based on how well a company turns data into information, information into insights, and insights into impact through improved decision making.

A big challenge for many companies is to structure data in a form they can use and make it compatible with other data sets. Such “data connectivity” is a critical focus of many companies because of the pressing need for “interoperability” among several different data bases to most effectively mine the data streams. Often, a company addresses its biggest constraint in taking advantage of the reams of data available by pouring money into pulling it in, curating it, managing it, assuring its quality, and making it accessible.

One interviewee reported that his company is trying to connect younger engineers with older repositories of data so they can learn more about the business from the past experiences of previous engineers, both as a way to expose them to different environments they may encounter and to prevent attempts to reinvent the wheel. A major advantage of a central data repository is that it allows many specialties to converge on a given problem and share information with each other, thus working in a multi-disciplinary, collaborative manner to solve problems in "real time" (an often used phrase).

Interviewees stated that their companies are emphasizing visualization as a key to translating data analysis into a form that is more interpretable by others. The goal, to get people not just to understand the data but also to engage with it, has promoted the use of interactive dashboards. Two trends have emerged. One is the increasing use of predictive analytics, which combines historical data with mathematical modeling, data mining, and machine learning to predict future trends. The other is a movement away from exclusive reliance on textual data to include pictures, audio, numbers, and multimedia.

The cloud: The third important digital tool is the movement of data to the cloud. "The cloud" is a set of software and services connected to the internet that provides tools to manage all features of data from storage to ready access to analysis. Many companies offer cloud services, including Google Drive, Microsoft OneDrive, and Apple iCloud. The cloud eliminates the need for local servers, expertise, and data management, making data available to anyone in the world who has password-protected access. As a result, companies no longer need IT operations at each facility worldwide. Interviewees report that this feature exerts a strong force for centralization. With centralized IT operations, companies can make IT-related changes once centrally on the cloud rather than having to send IT people out to train each facility's staff on how to use new or updated hardware and software.

The cloud has created substantial advantages because data and access to information used to be locked in company servers, with each major plant/office having their own server and protecting access to it. Now, ready access to data from any internet-connected device is instantaneous and global. Executives travelling no longer have to store sensitive files on their laptops. File storage on the cloud enables colleagues to collaborate on the same document. One interviewee said that data is easier to manage now because her company invested heavily in converting it into one uniform format.

3) Impact of Digital Technologies on the Workplace

Digital technologies have had a major impact on work and the workplace. We encapsulate this impact in sections on the customer experience, an emphasis on efficiency, use of metrics and measurement, the pace of change, and change management.

Customer experience: Possibly more than any other area, digitalization has brought attention to the importance of the customer/client and therefore the customer experience. Companies have employed analytics to improve customer relationship management, especially through developing metrics to measure it. AI and ML have aided responsiveness through, for example, substituting data from social media for work previously done

by market researchers and using ML to engage in customer segmentation. According to one interviewee, big data/AI 'is helping us deliver the right services to the right constituents at the right time.'

Clients increasingly expect digital solutions. Companies need to know not just what customers want but also why. Executives must have a good overall understanding of the relevant digital technologies and what they can do, though not necessarily the specifics of the algorithms they use. Companies that lead on using technology to solve business problems gain competitive advantage.

These improvements bear a cost. Amazon has raised customer expectations because it has prompted them to believe that they will be able to personalized orders to their own preferences and tastes, track their progress toward delivery, and receive them quickly, which constitutes a high bar for other companies to jump. Digitalization has promoted the use of "omnichannel" strategies, which have generated new opportunities through an expanded menu of channels while at the same time increasing the complexity of determining the right channels to use. In addition, a respondent noted that the pervasiveness of social media has changed the dynamic with dissatisfied customers and employees. Now it's "don't mess with me" because I can do reputational damage by posting negative comments about you online.

Efficiency: For many companies, the primary value of digital tools is to provide opportunities for cost reduction. A theme in the interviews is using AI algorithms to eliminate repetitive work or work that requires choosing from a few standard options, thereby generating process improvements that help deliver efficiencies. As a result, repetitive jobs are disappearing. Now, as mentioned previously, the goal is that bots handle 99 percent of the repetitive, patterned work formerly done by people, while humans handle the one percent of exceptions.

Metrics and measurement: Metrics and measurement have become central to digital discussions. The section on data referred to interactive dashboards. Call center employees are the most overtly closely monitored through metrics that include number of keystrokes, amount of time per call, and number of unhappy customers. The move to remote working during the pandemic has increased the importance of explicit objectives, targets, goals, and accountability, which must be communicated to employees to be effective.

Pace of change: Without exception, every interviewee who referred to the pace of change – and most did – reported that it has accelerated and the acceleration itself is accelerating. It creates uncertainty, stress, anxiety, and resistance. One said, "We live in a constant state of crisis." Change is a constant, ejects people from their comfort zones, and requires adaptation. Combining faster pace with data analytics creates an expectation that questions will be answered quickly because the information is at hand. Many respondents noted that the pandemic has greatly speeded changes that otherwise would have taken years, if ever, to develop.

Change management: In the face of employee tendencies to resist change, respondents remarked on the need for managers to commit to it, foster it, coach people through it, and train them in how to deal with it. They argue that the centrality of change management to company life requires skills that have not received sufficient emphasis. Some ask whether Moore's law now applies to the pace of change, under the premise that massive leaps in the pace of change are occurring every 18 months.

One interviewee provided an illustrative example of how he managed a proto-typical change management challenge. Tasked with guiding a group of product managers who were resisting a digitalization project because they felt threatened by it, he stressed that it was just a new set of tools. They did not need to be experts in the

technology but rather to know about it at an overview level. As they were trained in how to use it, their resistance lessened.

Company changed yet?: Multiple interviewees prompted us to stand back, stating that we could not take for granted that digitalization was pervasive in their companies. In some companies, it is well-advanced. In many others, while change is present, digitalization is still in an early stage of implementation. Although it affects the way tasks are accomplished, senior level managers have not recognized the strain it is placing on organizational structures, which will remain until the structures are changed. For example, one reflected that it offers a real opportunity to rethink how functions have been structured as well as the skill sets needed for the new realities. Unfortunately, many companies have not grasped that current structures are obsolete and stand as a barrier to change.

One structural change some companies have undertaken is to add a data management unit to manage the opportunities and constraints created by digitalization, charging this unit to look for ways to apply digital technologies to develop new organizational competencies. The impetus for their formation was to bring order to the duplicative efforts of divisions and departments acting on their own to digitize, with siloed divisions and functions developing overlapping projects, either unaware of work in other units or trying to beat them to the punch. As a result, these data management units, intent on eliminating duplication, span multiple siloes, dictate that projects cannot go forward without their approval, and seek to centralize decision making related to the development of digital technologies,.

The unit most frequently reported to have seen change due to digitalization is cybersecurity. When it came up in interviews, there was uniform agreement that the function has grown in size and importance. Structural change was not required because it mainly involved adding personnel to strengthen existing units rather than establishing new ones.

Examples were presented of positive structural changes. One interviewee said that her company had a large unit dedicated to digitalization with a forward-thinking mission. Its charge is to look for ways to use these technologies to generate greater efficiencies, automate repeatable jobs, monitor remotely for safety and efficiency, train AI to interpret data, and quickly review massive amounts of data rather than the months of employee time it had taken previously. Another respondent company was about to implement a digitally-influenced change in organizational structure by splitting into two main divisions, one concentrating on more traditional service delivery where processes could be evaluated for automation and the other focused on specialized services where digital innovation could play a major role.

Clear differences appeared across industries in the timing and extent to which companies are incorporating digitalization. When we observed to a consultant interviewee whose work spanned industries that we were surprised that bank back office functions were not more automated, she said that in her experience industries like banking, financial services, and pharmaceuticals lag behind because in the past government regulations constricted what they could do.

4) Impact of Digital Technologies on the Workforce

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Digitalization is changing many aspects of how we work, with a focus on greater efficiency. In response, employee capabilities must shift.

New ways of working: Digitalization has induced different approaches to work than in the past. Interviewees repeatedly cited the ability to lead and work in teams as a necessary skill. Work today is very project- and team-based. Teams have now become the main unit where decisions are made. It is essential to empower critical teams to act as opposed to past tendencies, or even requirements, to send everything to be decided up a central hierarchy.

Work life is moving away from hierarchical management by removing levels of approval and simplifying decision making processes, thus giving teams and employees more autonomy but at the same time holding them accountable for results. The emphasis has shifted from individuals working in their own offices to teams working in open space configurations. One interviewee talked about her organization as having a flat structure that relies on product and process leaders for each team, where leaders and members take up temporary assignments to work on a project. They then move on to another team that can benefit from their expertise when their services to the first project are no longer needed, which may happen when the first project is completed or when their specialized contribution to it is finished.

The idea that an experienced middle manager makes decisions for their departments is obsolete. Now decision making demands intimate knowledge of the parameters affecting a product and/or the dimensions of the relevant processes, requiring team leaders who can attract the right people, create an environment to facilitate their work, and motivate them. Work happens in "sprints" where major projects are cut into smaller pieces and teams are organize around them.

Digitalization is contributing to this increase in transparency and accountability for several reasons:

1) Data are readily at hand to support faster response times
2) The data resides in the cloud where it can be available to anyone
3) Teams are able to function whose members are not in physical proximity. Digitalization offers "the ability to work anywhere from everywhere"
4) It provides increased accessibility of and visibility to clients/customers and co-workers who, since the pandemic in particular, can be contacted any time of the day or night
5) It enables increased integration across positions and functions. It is no longer possible to finish a piece of a project and "throw it over the wall"
6) It makes it easier to see who is not doing their work
7) Some respondents thought that digital tools provided the opportunity to create innovative solutions to problems. For example:
    a. A company owner with a number of franchises reported that when the pandemic arrived he used a Facebook page as a platform for franchisees to communicate informally, ask each other questions, and provide mutual support
    b. Another foresaw a day in the near future where meetings would involve fewer printouts and more live data demonstrations. Rather than bring a 20-page printout, participants would bring a sheet of links to files. Attendees would come prepared to synthesize data rather than present it

On the other hand:

1) Content has increased significantly
2) More information is available, 'almost an overload'
3) It adds complexity to decision-making
4) The impression that employees are continually available has injected work further into non-work life
5) Pressures from the ubiquity of data have sped the rapid pace of change and contributed to heightened levels of anxiety, stress, and lower morale

There was an urgency to several interviewees' comments:

1) The new organization of work requires new competencies that must be mastered
2) The ability to embed them pervasively throughout the organization offers an opportunity for competitive advantage – or disadvantage if competitors are quicker to act
3) As one interviewee stated, "the company that captures the most value from the new technologies is likely to win in the marketplace"

New jobs, disappearing jobs: New jobs included data scientists, big data analysts, social media managers, and project managers. Opportunities for growth exist at the intersection of business and technology for people who can translate one to the other. The main benefit derived thus far from digitalization is automating repetitive processes. Jobs that involve programmable tasks, vulnerable to automation, are rapidly disappearing, an activity that is unlikely to slacken.

5) The Ethics of the Use of Digital Technologies

Digital ethics: For many respondents, ethical issues did not feature prominently in their work and thinking. They were not averse to ethical issues, rather they did not have many occasions to actively consider them. When considered, three main themes arose in response to questions we asked about ethics: privacy, cybersecurity, and job loss due to elimination of repetitive positions.

The main theme related to digital ethics was privacy – managing sensitive information, controlling it, protecting it, and the importance of informed consent. When asked about ethics, almost all of the European interviewees mentioned data privacy and seemed to view the General Data Protection Regulation (GDPR) positively. In the U.S., respondents in Human Resources most often cited it as a major concern because they actively managed the use of employee data for analytic insights while concerned about protecting employee privacy.

A second issue concerned the importance of cybersecurity, in particular efforts to prevent breaches. Unless their role involved some element of cybersecurity, respondents maintained modest concern for it. Europeans placed more emphasis on privacy than those in the U.S. while the reverse was true for cybersecurity.

The third issue was the elimination of jobs from digitally-generated efficiencies, which respondents regarded as unfortunate but inevitable. In another slant on the concern, one mentioned her employees' fear that if their work can be done remotely, can it be done more cheaply in other countries?

Two other somewhat related areas came up for data management. The first was that poorly constructed algorithms can create substantial harm. Recent examples have included machine learning exercises based on existing data that built in biases that adversely affect minority groups. The other was that data was sometimes wrong. It was of poor quality or collected poorly. Users were not sufficiently familiar with its characteristics and flaws. It was used for purposes it was not meant to address. Data collection instruments were faulty, for example, one respondent mentioned sensors to collect measurements that were not designed to measure results in a particular range, were out of range, out of calibration, or broken, but the users were unaware of it.

6) Skills Needed for Early Career Graduates

Our interviewees were happy to express their views on skills needed versus those possessed. They offered opinions on the characteristics of younger employees, the skills new graduates needed, the skills leaders needed, the extent of digital savvy executives needed, and the skills required to manage remotely.

Characteristics of younger employees: The current generation of graduates has grown up in the digital world and feels comfortable with it, much more so than older employees. They have the digital savvy, enthusiasm, and are quick digital learners.

The main element lacking was presented as a common scenario: When we ask new graduates to do some analysis, they use the digital tools they have been trained on, run the numbers, and come back to present the results. But they do not accompany their number crunching with analysis of why the results were obtained or what they mean. They lack the ability to apply critical thinking to the results and are unable to interpret them and turn that into a story. Technically trained graduates understand the principles of data science but not how to apply it to a client – they are solutions in search of a problem.

Interviewees questioned several additional characteristics. They opined that younger employees were uncomfortable with interpersonal relations, found it difficult “to look someone in the eye when they are talking to them,” wanted it now, got easily bored, lacked business acumen, lost sight of the bigger picture, lacked resilience, and were not good at working under pressure, not persistent, and gave up too easily.

Skills new graduates need: Words used repeatedly to describe the skills new graduates need included:

1) Interpersonal skills: social/interactional, emotional intelligence, ability to know their own skills
2) Teamwork skills: huge emphasis on the importance of teamwork and collaboration, along with the ability to communicate effectively, both verbally and in writing
3) Adjustment skills: agility, adaptability, flexibility, resilience, nimbleness, ability to pivot, open mindset, ability to respond to change, realistic expectations
4) Personal characteristics: frequent mention of self-awareness as a critical skill, enthusiasm, humility, patience, perseverance, stamina, passion, positive attitude, energy, independence, competitiveness, intellectual curiosity, thirst for knowledge
5) Thinking skills: ability to understand a problem, analyze it, and solve it with limited time and information, to think critically, focus/concentrate amid lots of noise, learn quickly, prioritize, see the big picture

6) Organizational skills: customer orientation, professionalism, business etiquette, and ability to understand how organizations work, to influence without authority, to work in different contexts, to make presentations, and to interview well
7) Technical skills: digital savvy, data-driven, ability to interpret results of data analysis and to separate content from 'gadgetry'

Regarding technical skills, many respondents emphasized the importance of quantitative skills for new business school graduates. The consensus was that they do not need proficiency with specific tools, they need the ability to quickly learn them, to be comfortable with continuous learning, and to keep up with the latest tools. The most often mentioned current tools included R, Python, Tableau, SQL, Excel, Microsoft Azure, AWS, and programming. There were differences of opinion on whether coding skill is needed. One listed a "five-tool bucket" of required technical skills: a database tool, cloud tool, digital tool, modeling tool, and coding tool.

Skills leaders need: Responses indicated that leaders need many of the same skills as new hires, with a slant toward additional ones specific to it. Below we limit ourselves to dimensions raised in the interviews.

1) Interpersonal skills: understanding of psychology/human relationships, active listening, ability to be diplomatic but truthful, emotional intelligence, ability to socialize, empathy
2) Communication skills: oral and written, persuasive, social media communication
3) Team leadership skills:
    a. Team building: to empower, support, coach, mentor, inspire, engage, motivate, and develop their people, to give feedback, to connect employee work to a purpose, to engender trust
    b. Team management: to communicate effectively, encourage collaboration, manage multiple generations and multiple cultures, manage impatient younger employees, promote objectivity, combat cognitive bias by questioning alternatives, generate diverse solutions, manage employees with technical skills, recruit and retain top talent
    c. Team governance: to make information more available, democratize it, rely on collective intelligence, encourage participation in decision making, demonstrate transparency
    d. Change management: to lead change, rally the troops, deal with resistance, and calm anxieties and fears
4) Adjustment skills: Resilience, adaptability, flexibility, agility, ability to cope with change, continuous learning
5) Personal characteristics: endurance, ability to withstand pressure, optimism, responsibility, patience, commitment to continuous learning, ability to stay current
6) Thinking skills: problem solving, creativity, innovation, task management, and time management
7) Organizational skills: business acumen, ability to drive the business, see things from the customer's perspective, stay up with organizational and industry changes, be aspirational about the business
8) Sensitivity to social issues (for executives): ability to address and take the organization through issues like social bias and racial unrest, drive sustainability, act in a visibly ethical way, and "walk the minefield" of political correctness
9) Pandemic-related skills: ability to manage virtually: run meetings online, maintain close contact with people, track performance, facilitate remote collaboration, and show empathy and compassion for the pandemic-related stresses experienced by many of their employees

10) Technical skills: familiarity with the functions of relevant digital technologies, what they can and cannot do, their applications, and insights they can provide

Asked to rank order them in importance, one interviewee summed up a widely held view, "Communication is always number one, if the boss can't adapt, no one will ever adapt, it's clear." Another cited a distinctive example from the multinational he works for, "At our company, we brought in a Chief Storytelling Officer."

Another interviewee posited that it is easier to teach a business person the technology than the technical person the business. This view contrasts with an opposite assertion that did not surface in the interviews but has been stated elsewhere, that it is easier to teach a technical person business than a business person technology. It seems likely that the first view holds a definition of technology that involves knowing software like Excel, R, Python, and SQL while the latter has in mind the depth of understanding that comes with an engineering or computer science degree.

Extent of digital savvy needed by executives: All interviewees said that leaders need to be able to function in a digital world whether or not they are digital experts. Many if not most do not have to become experts in the nuts and bolts of how each digital tool works – they do not need to know how to construct an algorithm – but they need to be aware of the tools, understand what each provides, what each enables them to do, and, equally important, what its limitations are.

For many leaders, this task involves a steep learning curve. They must take the time to learn about and understand the technologies relevant to their responsibilities, be open to new technologies, and stay up-to-date with the frequent changes to technology that occur. This requirement points toward the value of their companies providing training rather than relying on them to do it on their own.

One respondent framed the task as: "If leaders do not understand the use of data in their jobs, they do not understand what digital makes possible. They cannot compete. They do not demand the right level of capability, the right answers, from their employees, which means they are operating at a disadvantage. They do not know what they do not know. They do not even know what to ask."

The respondent continued, "Senior managers' apparent complacency is a huge issue. We need to show them what it takes. It is a really hard. We have had to get whole swatches of our leadership team up this learning curve very quickly. As we go down in layers, most of our leaders are not used to needing this kind of in-depth technology or digital acumen. We have to push people to a different level of capability. We want to switch from having little pockets of technology-savvy managers to connected competence all the way through the ranks."

Skills needed to manage remotely: The pandemic highlighted how digital technologies enable teams to work together despite being geographically disbursed, whether in the next building or half-way around the world. Respondents said that managing well remotely requires its own skill set and thought that managers were ill-prepared for the job. Very few of their companies provided training. One asked the question: exactly how good is virtual versus in-person – 50% as good? 70%?

Leaders should set an example, be open themselves to using digital tools, and encourage employees to use them. Interpersonal skills are key to success in a virtual environment – how to support employees, build trust, engage with them without seeing them, carefully structure the content of communication and its frequency, and

get results when contact is limited. In addition, companies need to address governance issues that are specific to managing virtually.

Pressure, stress: Finally, mixed all the way through the interviews was the constant presence of pressure and stress and the need to manage it effectively for oneself and one's employees to perform well.

7) Impact of New Skill Requirements on Business School Curricula

Respondents had few specific recommendations regarding educational approaches. They seemed reluctant to tell us as experts what pedagogies to employ. It may be easier to understand if we switch the shoe to the other foot and imagine how we would reply if managers asked us questions about how they could do their jobs better.

B-school education: The predominant view was that business schools should focus to the extent possible on inculcating the skills listed above in the "Skills New Graduates Need" section. They advocated exposing students to practice as much as possible through activities like internships, company projects, realistic role-plays, and group work within time constraints, viewing them as essential to college student education. A few opined that enabling students to obtain certificates on the use of relevant technical tools, for example, Azure, AWS, ERP, would be valuable because they would indicate to employers that the new graduate has learned a useful practical skill**.**

Although not uppermost in most minds, there was an undercurrent of belief that quantitative skills were more necessary than ever for business school graduates to deal with a business world that has become much more quantitative. Data analytics is so central to decision making either as a goal or a reality that new graduates need to be familiar with its underpinnings. The closer employees are to entry level, the more likely they will be using quantitative skills in their jobs. They need to know enough about a tool to understand how to use it, what its capabilities are, and how to determine whether the results are credible. In addition, as the workplace becomes more automated, business school graduates increasingly need to be able to interact effectively with computer scientists, data scientists, and engineers to represent their units and receive maximum value for them.

"Digital mindset": Whether or not they referred to it explicitly, many interviewees claimed a shift in thinking was needed that was large enough to call for its own term, a "digital mindset." One defined it as "not knowing particular tools but knowing how to learn, how to adapt to different digital tools and understand what technology can offer." Others specified a willingness if not eagerness "to open one's mind to learning new skills." "It's not just a matter of technology, it's a matter of thinking that you can work in a different environment, to cooperate differently, to get into this new way of thinking." If "data is the new currency," then a revised approach to work parameters that signals the importance of digital tools calls for a new mindset.

8) Impact of the Pandemic on the Use of Digital Technologies

Since our interviews were conducted in the midst of the pandemic, the opportunities and constraints it created and subsequent required adjustments featured prominently in interviewees' minds. Our interview protocol

included a last section with questions specifically on the pandemic, but many interviewees brought it up well before we reached that section.

Work during the pandemic: Respondents commonly reported that they were always in work mode despite working from home and that others seemed to think they were available any time of the day or night. As a result, many people worked more hours at home than they did at the office and were less able to separate work from home, making it easy to overwork. "The upside is that you are always plugged in, the downside is that you are always plugged in." The dilemma generated much discussion about work-life balance. In attempting to characterize the blurred lines between work and non-work life, an interviewee called it "work-life blend." Another referred to "work-life choices," with the implication that the pandemic work-from-home conditions brought a need to choose to work more as a feature of executive and managerial responsibilities.

Most respondents were sufficiently well off and at a stage of life where they had less complicated arrangements at home than those with younger children. They had home offices or spaces that they readily turned into home offices. They had high-speed internet access. Their children were no longer in primary or secondary school, so they did not need to concern themselves with on-line learning or remote study. Those who had working partners reported that they were able to allocate time and space in mutually agreeable ways. Their positions in their organizations made them privy to more information on the company's decisions than those lower in the chain of command and they were less vulnerable to being furloughed, laid off, or terminated, even if their primary responsibility was managing a shuttered plant or office. Where concerns arose, they often involved college-attending children who were studying remotely from home and elderly parents whose vulnerability to Covid was a source of worry. While we did not ask directly, only one interviewee self-reported having had Covid.

Although respondents undoubtedly faced many of the same circumstances, the pandemic-related conditions they described primarily concerned the situations facing their direct reports. Negative aspects of remote work included: isolation, stresses from significant pressures and Covid-related changes but no one to talk to about them, too much time in front of a computer screen ("Zoom fatigue"), missing personal contact with friends at work, and juggling work and family responsibilities. Executives frequently mentioned their direct reports' mental health as an area of concern. For the first time in their careers, they felt the need or were directed by their companies to inquire about personal circumstances: How are their direct reports coping? How are they feeling? Is their family OK?

Interviewees raised concerns about how to best manage remotely in the absence of any previous experience with it: How can I monitor people for their performance from a distance? How can I handle people who seem to be multi-tasking in meetings – which would be visible in a physical setting but less so online – rather than engaging fully in the meeting? Should I insist that meeting participants turn their videos on? How can I ask what my team members have on their plates personally when in the past there was an implicit understanding that personal matters were out of bounds? How close should I get? Interviewees reported their own main problem as online meetings scheduled back-to-back from early morning into the evening that left them exhausted and depleted.

As a show of concern for personal well-being, leaders reported trying to be more accommodating and more considerate. They felt the need more than previously to attend to morale issues, employee engagement, and

company culture. An aspect of their job that became harder was the need to undertake frequent check-ins with their direct reports whereas in the office they could just walk the halls.

Effects of the pandemic: As one interviewee phrased it, "there's nothing like a good crisis to force people to change." Another framed the larger picture as involving three dimensions: the pandemic, pandemic-induced recession, and social unrest. The effects of these conditions were wide-ranging and deeply felt. Examples included:

1) The pandemic created very difficult conditions for some respondents' companies. Some lost significant revenue, leading to
2) Furloughs, layoffs and/or terminations
3) A lack of new investments, along with directives to finish existing projects but not start new ones because funds were not available to finance the work
4) Fears by some employees that if management saw that work could be done remotely, what was to stop them from sending the work to lower labor cost countries overseas?
5) It took people out of their comfort zones
6) High degrees of stress and exhaustion, eventually accompanied by lower morale
7) On the retail side, permanent closing of stores
8) The need to try to protect critical employees from getting Covid, often under difficult conditions
9) Concerns about the ability of lower level employees who were laid off to take care of themselves and their families

On the positive side, there were also profound developments. Examples included:

1) "The pandemic united us in a way because we all experienced it together. We now understand more of our employees' humanity because we see them in a home environment, which is more personal"
2) It gave permission for the first time to acknowledge the anxiety and stress many people were feeling
3) It generated more awareness of and expressions of concern for how colleagues were feeling, and the empathy, compassion, and humility to reach out in a more personal way
4) It promoted greater collaboration with colleagues, customers/clients, suppliers, and government officials to manage never-before-seen challenges
5) It sometimes led people from rival companies to work together to solve mutual problems and, in the process
6) Be more open, share more information, act in an "all in it together" manner, be mutually helpful, therefore creating greater transparency, which led to trust
7) It honed companies' ability to prioritize and collaborate, provoking closer alignment by inducing greater efforts to get everyone on the same page with the same priorities
8) For priority areas, decisions were made much faster. Lower priority areas were pushed to the sideline
9) It prompted people to continually challenge why the company did things the way it did and raise questions about whether they could be done differently
10) It generated greater appreciation for the value of technological tools. In the process, it forced previously resistant executives and managers to become more technology savvy. Beforehand, it was "I'm better than the tools." Afterward, it was "I need the tools"

11) In one interviewee's very risk averse, take things one step at a time culture, it forced the company to be agile, iterative, and learn as they went. In response, "we did projects in two weeks that would have taken several months to do"
12) It delivered fundamental changes in ways to do business effectively without being face-to-face, like how to facilitate virtual meetings, communicate, and get points across virtually

Post-pandemic: There was a widely-shared view that the pandemic pushed the implementation of activities that would have taken much longer to come to fruition under normal circumstances. Foremost among them was to foreclose debate about whether remote work could be done effectively at scale. Post-pandemic, for many office workers, remote work was here to stay, if not every day, at least one-two days a week. To clarify that boundary conditions would be put around remote work, one respondent said that "it will become one solution, not the only one."

The second area that generated general agreement was that there will be less travel. People are more comfortable using video conferencing to enable remote meetings. Many meetings that generated travel in the past will yield to the lesser time impingements and costs of video conferencing. The shorter the expected meeting, the less likely travel will be necessary.

There is a greater perception that teams are not geographically bound. We can expect increased use of multi-location teams in the future, some of which may never meet in person.

The use of digital tools will increase. Many people who prior to the pandemic were unfamiliar with video conferencing or collaborative tools like Slack and Box, now feel comfortable with them. They may become more receptive to learning about more sophisticated digital tools connected to artificial intelligence, machine learning, and data analytics.

Finally, there was an upsurge in appreciation for qualities like agility, flexibility, adaptability, and resilience as requirements for future success at work. Increasingly acknowledged as important prior to the pandemic, their visibility was elevated by it.

Less certain but worth tracking is whether concerns for the personal lives of employees, shifts in work-life balance toward greater availability outside normal work hours, and greater collaboration will outlast the pandemic and whether the notion of a "digital mindset" will become an established concept representing a necessary attitude toward the role of technology in business.

In Conclusion

Digital technologies are integral to the conduct of business. They have brought rapid changes to the workplace that require new skills and a new mindset. Their effects are seen most clearly in the automation of repetitive jobs, where algorithms increasingly capture essential elements of the work and manage the tasks at hand without the need for human intervention. As the use of artificial intelligence and machine learning become more prevalent, the threat to non-routine jobs will increase.

Going digital has required the creation of new sets of jobs like data analyst, web developer, and social media manager. Functioning effectively in a digital environment increasingly requires familiarity with quantitative analysis. Once an optional subject to emphasize in business schools, it is now a necessity. With digitalization

has come opportunities for rapid decision making based on “real time” results. The effect has been a quickening of the pace of change, and what our respondents perceive as the ever-present demands of change as an area to manage. The perception of interpersonal skills as necessary to success in organizational life has never been higher. Since our task force was charged with investigating the impact of digitalization on the field of management, we welcome the primacy of interpersonal skills as central to our discipline and look forward to addressing the need for innovative instructional approaches to provide the education these skills require.