DOES PRIVACY MAKE GROUPS PRODUCTIVE?

A dissertation presented

by

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In partial fulfillment of the requirement

for the degree of

Doctor of Business Administration

in

Management

Harvard Business School

Boston, Massachusetts

April 2013

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Does Privacy Make Groups Productive?

Abstract

Transparency is one of the great cross-disciplinary themes of management and organizations today. Increases in transparency, or accurate observability, of activities, routines, behaviors, strategies, output, and performance promises higher performance through improved learning and control, and thus collaboration and decisioning, inside and outside of the organization. Advancements in sensing, surveillance, search, and related 'big data' technology have produced a renaissance in the meaning of the word "transparent," enabling a new generation of organizations in which broad access to real-time observation is the norm. Yet a foundational question about transparency remains unanswered: are there circumstances under which too much transparency might be detrimental to group performance? Put differently, are there circumstances under which privacy makes us productive?

I have three primary conclusions. The first is that transparency holds great promise for organizations, but to be effective, approaches for achieving transparency must extend beyond making environments more observable. *Accurate* observability is far more difficult to achieve than mere observability. For human beings, who are prone to changing behavior to regulate attention when either observed by others or observing others, increasing observability can have the result of reducing authenticity and thereby transparency, a result I call the Transparency

Paradox. An organization that fails to design effective zones of privacy may therefore inadvertently undermine its capacity for transparency.

Second, the Transparency Paradox has been elusive not only because relatively few researchers have sought to rigorously study the performance implications of transparency, but also because those who have done so have used different methods, literatures, and even vocabularies. Transparency and privacy are interdependent opposites yet are studied separately. This dissertation is at least as integrative of existing, diffused literatures as it is built upon new empirical participant-observation, field experiment, and longitudinal survey findings.

My third finding follows from those two: a nuanced theory on transparency requires an appreciation for both the observation of activity *and* boundaries across which observation is limited. How such privacy boundaries are constructed, legitimized, and timed partially defines the level of transparency, and performance, an organization can achieve and are thus important, yet underutilized, managerial levers. Privacy can make groups productive.

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To you,

the reader,

for giving life to this work

by using it to make a difference in the world

Acknowledgements

The great irony of sole-authored work is that it draws even more heavily on others than co-authored research. For me, this dissertation has been a miraculous process of standing on the shoulders of giants—generous, selfless giants whose influence on this work, and on my development as a scholar, has been far greater than they would modestly admit.

On Friday, February 2, 2007, I interviewed for the HBS Doctoral Program in Management with Clay Christensen, Michael Tushman, Toby Stuart, Andrew Hill, and Dianne Le. This adventure, and my trajectory, will forever be shaped by their decision. Clay's phone call to communicate the offer, at 6:30am on February 15, 2007, was by far the best wake-up call I have ever received.

I can credit my official dissertation committee with many things—counseling me on methods, brainstorming framings, marking up multiple versions of papers, writing references—but the most meaningful has been that someone always knew exactly the right thing to say at every turn. To them, perhaps these nuggets were just thoughts in-passing—but to me, they were the anchors that enabled me to climb the rock.

Nitin Nohria believed that I would find something if I went into the field (perhaps because of his own experience in a factory a long time ago), and then when I found too much, he actively listened to me babble about our observations and, in real-time, helped me draw lines straight to the most productive framings and findings. Nitin's perspective always turned out to be prophetic, and I appreciate Nitin's patience with me even when I needed to follow my own path to the same destination. His dedication to mentorship was a significant source of inspiration—I know of no one else who, upon being appointed Dean, would write "I remain committed to helping you with your dissertation and will ensure that my schedule doesn't get in the way." It never did.

Amy Edmondson was a perpetual source of confidence. The road to a doctorate can be bumpy, and to have Amy tell me that I was doctoral student about whom "she never worried" reduced my stress levels immeasurably. When I struggled to find the proper balance between inductive and deductive in the framing of my first sole authored paper, it was the meeting with Amy which ultimately cracked the problem. Amy was also the voice of reason in saying: "do good work and everything will be fine."

From the very beginning of the doctoral program, Clay Christensen's enthusiasm for my work, and for me, has been one of the highlights of my experience. Throughout the many hours we have spent together, whether in his office or in the classroom, I always emerge from time together with Clay feeling far more energy than I had at the start. His passion for scholarship and teaching, in spite of health challenges, is inspirational. Clay also knows how to ask great questions. In one of our very first meetings, Clay taught me the beauty of simple yet big questions like the one he asked during his doctoral studies: "Why do great firms fail?" At that moment I promised myself that my research question would also be five words or fewer—thus the title of this dissertation.

Every meeting with Richard Hackman was a delightful experiment. Through Richard, I fell in love with teams, groups, and meso-level phenomena, and I found an intellectual home in GroupsGroup. Richard was blunt but never harsh, opinionated but never overpowering. Conversations with Richard got me through some of the hardest theoretical moments—my ability to develop rigorous constructs magically improved anytime I was in his office. I never imagined that his email congratulating me on my faculty appointment would be the last I would receive from him. He remains a towering figure in my work, and I miss him more than words can express.

Brad Staats has read more drafts, and provided more detailed comments, than I could ever have imagined. Looking back over what he has accomplished in the past four years, I have no idea where he found the time, but I am forever grateful that he did. When the devil was in the details, Brad showed me the way through. Having watched how smoothly he has gone from doctoral student to tenured faculty, Brad continues to serve as a role model for me.

Through the job market process, I have met an impressive number of impressive people who identify themselves as a student of one, or more, of those five people. I feel privileged to be among them.

Official definitions of the phrase "dissertation committee" aside, there are a number of people without whom this manuscript, and the deeply rewarding intellectual experience it represents, would not exist. Rosabeth Moss Kanter has been an unequivocal fan, friend, and champion, and much of what I learned about field interviews I learned directly from her. Leslie Perlow not only taught me how to turn field data into results, but also invited me into her QUIET group where I met many others who have contributed to this work. Michel Anteby deserves special recognition for helping me to find the "twist" in my observations. Mike Beer has been a long-time thought companion. John McArthur provided a few key sparks for this research in its very earliest days. Robin Ely, on multiple occasions, helped me get the core of this work ready for publication. David Lazer has been a key supporter and immediately saw the cross-discipline relevance of this work. Anita Tucker missed an important meeting to share with me key ins and outs of field research the day before I left for China. Thanks to Lee Fleming, I will never forget the phrase "omitted variable bias." Frank Barrett helped me improvise through key moments of theoretical challenge—and gave me a push whenever I needed it. Francis Frei, in an act of pure selflessness, reached out and intervened to help me do what all doctoral students must do at some

point—take seriously the steps required to mature into a professional academic. David Brunner has one of the most beautiful minds I have known, and he frequently used it to add precision to my thoughts and logical arguments. RC, from whom I have learned a lot about leadership, graciously and eagerly put an earlier version of this work to use in an organization that impacts all of us. As a mentor and friend, EW has encouraged, nudged, and on occasion transformed me—she remains a role model for the kind of leader I hope to teach others to become.

For all those mentioned above, and the scores of other faculty who have been meaningful to this journey, I hope that in some way the investment you have made in this effort has proved helpful to you, as it has to me.

Field research requires a field site, and I am forever indebted to one faculty member for access to an extraordinary laboratory: Willy Shih. On November 15, 2007, Willy and I fell in love with the idea of doing field research together at PrecisionMobile. We quickly became partners-in-crime in what can only be described as a highly ambitious project. To outside observers, we must have appeared an odd couple: he had a Ph.D. in Chemistry, 28 years of experience in industry including senior executive roles, several board seats, and endless connections in science and technology-intensive fields; I had a JD/MBA, four years of experience at BCG, and five months of doctoral training. But our resources, and questions, turned out to be highly complementary, and we shared a passion for making things happen. My metaphorical image of our partnership will forever be cemented by one of the many immigration officials we met throughout our travels, who asked us: “are you two Twins?” From a glance at our passports, it turned out that the tall, Asian, accomplished executive and scholar and the short(er), Caucasian, doctoral student share the same birthday. Five months after our first meeting, we were on a plane to China with resources, access, support from key executives, a

broad research agenda, research assistants to act as embeds, IRB approval, and a rigorous research approach. I like to think that we never would have been successful in the field without each other, but I know I would never have been able to do this without Willy. He has used the data we collected for a number of well-received publications, and I have used it here. I will always look back on our collaboration fondly.

I owe the data itself to a special set of individuals. To this day, I do not understand how over 60 Harvard undergrads would be attracted to apply for a research assistant position which would involve working long days as an ordinary operator on a factory floor in China. The five whom I chose—Jieliang Hao, Xiao Cong, Steve Lin, Nate Ren, Wendy Wang—were superb. Their level of dedication, maturity, and sophistication made the experience, and the data, extremely high-quality. Even on the most challenging days, their attitudes kept the team going. On their behalf, as well as my own, I also thank thousands of Precision employees for being transparent with us. They are paid to produce products, not talk with academics, yet they were generous with the little free time they had. Finally, I wish to anonymously thank a few key Precision leaders whose names I cannot mention without sacrificing the anonymity of the site. None of this would have been possible without substantial commitments of time and effort to be the excellent partners you were. I hope you indeed have seen returns, both individually and collectively, from our joint efforts.

The Management DBA program at Harvard is special. I have come across few, if any, other programs that would have permitted me to do this work, let alone given me what I needed to be successful in doing so. As leaders of the program, Clay Christensen, Mike Tushman, Jeff Polzer, and Amy Edmondson, along with a superb Doctoral Office, fostered an environment that made all of this possible. I hope the Management DBA program continues to provide students with the

"privacy" and freedom to do unconventional work and the conventional methodological training to make them successful in it. If there were one reason I will miss being a doctoral student, it is because of my fellow doctoral students—you know who you are.

Harvard Business School is special not just for its faculty and its students, but also for its world-class staff. My highly productive collaboration with Toni Wegner, Ken Carson, and Alicia Mendoza not only helped me to meet the strict requirements of the IRB, but also improve my original research design. Harvard researchers are lucky to have such an accomplished human subjects team. Susan Deavor, Barbara Devine, Sheba Raza, Lisa Stone, Emily Snyder, Christopher Dial, Linda Kelly-Hayes, and many others regularly made logistical magic happen.

I acknowledge gratefully the funding I received from the Division of Research at the Harvard Business School, the Harvard Law School, the Kauffman Foundation, the 2010 Susan G. Cohen Doctoral Research Award (awarded by the Center for Effective Organizations at the University of Southern California Marshall School of Business), and the 2012 Wyss Award at the Harvard Business School.

Most of all, I thank my co-author in life, Maly, for supporting me in this longstanding dream in ways that no one else could. Although our newborn son Covell sat patiently in my lap while I wrote some of these pages, most of my writing was done in seclusion thanks to Maly's dedication to Covell. Somehow, she still found hours and hours to discuss this research with me, read my drafts, and help me figure out how to make sense of this very complex puzzle. She knows me better than anyone else and therefore already knows that I could never have done this without her. When we first started dating, she once wrote to me: "If we've come this far it's because your confidence, kindness, and delicate balance of patience and impatience has been very helpful in guiding us." With my deepest love and respect, I feel the exactly the same way.

Chapter 1: Introduction

“I like seeing people when they can't see me.” (Smith, 1999: 63)

The starting point for this dissertation is an unsettling result: in a globally admired company, responsible for making 1 out of every 25 mobile phones manufactured in the world, transparency on the factory floor systematically *reduced* performance by 10-15%. When left less watched, lines produced better and faster. Could such well-established management precepts as "Management by Walking Around" (Peters & Waterman, 1982: 121) and "the more strictly we are watched, the better we behave" (Bentham, 2001: 277) be wrong?

Were it not for participant-observation by embedded researchers on factory lines, a carefully instrumented field experiment, and hundreds of pages of qualitative field notes and interviews, I would have questioned the data. But sometimes the field has something to tell you, and it says it so clearly that the message cannot be mistaken. In this case, in the words of one worker, boundaries from observability provided "the privacy we need to get our work done."

This research did not start with a proposal to study privacy. Quite the opposite: I was in search of a better understanding of the causal link between transparency and performance. But as so often happens in field research, the inductive road to meaningful insight is unpredictable and is best guided by data and results. I had no idea that I would end up developing novel understanding of how privacy makes us productive, but that is what happened at the field site. As a result, rather unconventionally, this dissertation will first introduce results and then seek to explain them, beginning with the results of initial, inductive participant-observation in Chapter 2.

Nevertheless, with results in hand, I began to discover explanations for these results on privacy and productivity hidden in the most unusual of places. While most management scholarship and practice has remained relatively immune to questioning the benefits of

transparency, there have been unexpected 'protests' in nooks and crannies of research and practice. This dissertation attempts to use empirical results to give voice to that growing body of knowledge, by providing supportive field experiment data. Chapters 3 through 5 of this dissertation therefore go deep into the theory of why privacy might indeed make us productive.

Having digested the data and found theoretical foundations to explain it, I started seeing the same phenomenon in others' research about social psychological mechanisms, namely attention. Chapter 6, the most exploratory part of the dissertation, pairs that research with survey data from the field experiment in an attempt to begin generalizing these results on privacy beyond the context of the field experiment and the question of why privacy might make us productive to explain *how* it might do so.

As far back as the 19th century, scholars have been grouped into two types based on their proclivities: "lumpers," who integrate multiple concepts into larger categories for broader meaning, and "splitters," who slice the salami a bit thinner to make categorization more precise and thereby deepen understanding (Hirsch & Levin, 1999; Morowitz, 1979). This work is a hybrid of the two. On the one hand, the primary purpose of this dissertation is to join ("lump") the concepts of transparency and privacy into one consistent theory. On the other hand, while both the transparency and privacy literatures are rich with insight on fundamental human rights, needs, and bureaucratic tendencies, this work very narrowly instruments transparency *and* privacy in terms of organizational *performance*.

A singular focus on performance allows this work to ask a simple, yet unanswered, question: does privacy make groups productive?

Chapter 2: Introducing the Transparency Paradox

Seeing is believing. (Proverb)

Seeing is not always believing. (Martin Luther King, Jr.)

Organizations' quest for worker productivity and continuous improvement is fueling a gospel of transparency in the management of organizations (Bennis, Goleman, & O'Toole, 2008; Hood & Heald, 2006). Transparency, or accurate observability, of an organization's low-level activities, routines, behaviors, output, and performance provides the foundation for both organizational learning and operational control, two key components of productivity that Deming (1986) identified. As an antecedent to enhanced organizational learning (e.g., Levitt & March, 1988), transparency may improve some of the processes that scholars have shown to be important. For example, it may improve one unit's access to the expertise, experience, and stored knowledge of another (Hansen, 1999), thereby creating the potential to increase the quantity and quality of knowledge transfer (Argote, Ingram, Levine, & Moreland, 2000) and shared understanding (Bechky, 2003), accelerate organizational learning curves (Adler & Clark, 1991), improve retention of organizational knowledge (Argote, Beckman, & Epple, 1990), or increase network ties for the exchange of knowledge related to learning before doing (Pisano, 1994). Similarly, it could neutralize the skewing effects of impression management (Rosenfeld, Giacalone, & Riordan, 1995), facades of conformity (Hewlin, 2003), or organizational silence (Morrison & Milliken, 2000) on meaningful information flows up the organization to reduce the risk that localized problem solving will fail to contribute to organization-wide learning (Tucker, Edmondson, & Spear, 2002), while conversely enhancing top-down leadership by providing greater insight into organizational goals and strategy set by senior management (Beer, 2009: 29–33; Berggren & Bernshteyn, 2007; Bryant, 2013). Transparency concurrently may enable operational control by ensuring access to richer, more extensive, more accurate, more disaggregated, and more real-time data by managers and employees, thus improving both hierarchical control (Adler & Borys, 1996; Taylor, 1911) and peer control (Barker, 1993), or

what together has been called chimerical control (Sewell, 1998). Senior leaders are therefore redesigning their organizations to make more work more visible more of the time, embracing innovations such as advancements in surveillance and knowledge search technologies (Levinson, 2009; Sewell, 1998), open workspace design (Zalesny & Farace, 1987), and "naked" communication of real-time data via advanced information technology tools (Rosen, 2001; Tapscott & Ticoll, 2003).

This trend toward transparency has been particularly evident in the design of the world's factories, where visual factory implementations have been "spreading . . . like a trail of gunpowder" (Greif, 1991: 1). Most modern-day facilities are designed to provide near-perfect observability of the actions and performance of every employee, line, and function. This observability serves as an important foundation for all aspects of the Toyota Production System DNA (Spear & Bowen, 1999) and is a necessary antecedent behind the seventh principle of the Toyota Way: "use visual control so no problems are hidden" (Liker, 2004: 149–158). Factory managers and employees need to see activity in order to improve it. Accurate observability also provides the basis for many of the widely accepted practices in total quality management (TQM) implementations (Hackman & Wageman, 1995), which target simultaneous improvements in both learning and control (Sitkin, Sutcliffe, & Schroeder, 1994). An emergent logic about the relationship between observability and performance has thus become dominant in theory and practice: organizations "that are open perform better" (Tapscott & Ticoll, 2003: xii).

Nonetheless, the implications for organizational performance of increased transparency remain surprisingly unstudied, both in factories and more broadly. Without sufficient empirical, field-based evidence of a causal relationship between observability and performance, uncritical assumptions about that relationship have germinated (Hood & Heald, 2006). Rarely does one

hear about any negative effects of transparency or problems stemming from too much transparency.

There are, however, reasons to be skeptical that transparency is such a panacea: detailed field work from the long tradition of factory floor research in management science has documented instances in which observability has encouraged *hiding* behavior among organization members (Burawoy, 1979; Dalton, 1959; Hamper, 1986; Roy, 1952), producing only the appearance of enhanced learning and control without real benefits to organizational productivity, continuous improvement, and performance. Dalton (1959: 47) described how managers, mandated by their superiors to conduct "surprise inspections," instead chose to "telephone various heads before a given inspection telling them the starting point, time, and route that would be followed" so that each inspection would simply "appear to catch the chiefs off-guard." Roy (1952) and Burawoy (1979), in reconfirming the "restriction of output" observations in the Bank Wiring Observation Room at the Hawthorne Works (Mayo, 1933; Roethlisberger & Dickson, 1939), provided substantial detail on the "quota restriction" and "goldbricking" activities in the Greer machine shop (Roy, 1952), which only became worse when managers were in sight (Burawoy, 1998; Roy, 1952). Subsequent insider tales from one of General Motors' largest and most open plants portrayed management's stance on various workarounds like "doubling up" as "a simple matter of see no evil, hear no evil," leaving workers with the challenge of hiding their self-defined "scams" within the context of an observable factory floor—the more observable the factory floor, the more effort "wasted" on hiding them (Hamper, 1986: xix, 35).

Each of those facilities was designed to be extremely transparent, yet those organization designs with high observability resulted not in accurate observability but, rather, only in an "illusion of transparency" (Gilovich, Savitsky, & Medvec, 1998)—a myth of control and

learning—maintained through careful group-level behavioral responses by those being observed. Although observability was achieved through the removal of physical barriers like walls, *accurate* observability (transparency) was not. Goffman (1959) originally suggested that increasing the size and salience of an "audience" has the tendency to reduce sincerity, and to increase acting, in any "performance." Analogously, increasing observability in a factory may in fact reduce transparency, which is displaced by illusory transparency and a myth of learning and control, by triggering increasingly hard-to-detect hiding behavior—a result I term the "transparency paradox."

To untangle the transparency paradox, this dissertation presents a behavioral model of observability in organizational design, based on both qualitative and experimental field data, in an empirical setting that uniquely allowed me to investigate transparency within the locus of organizational experience and performance. I began by studying workers at the mobile phone factory of "Precision" (a pseudonym) in Southern China, which was the second largest mobile phone factory in the world at the time. Over the past century, factory studies have been central to building the foundations of organizational theory (Roethlisberger & Dickson, 1939; Roy, 1952, 1960; Taylor, 1911); however, I chose these workers not because of the type of work they did or because they worked in the epicenter of Chinese outsourced manufacturing but, rather, because organizational life for them was extremely transparent, in both actions and performance. In accordance with best practices for visual factory design (Greif, 1991) and TQM (Hackman & Wageman, 1995), visibility was everywhere. There was a clear line of sight across factory floors, each football fields long, such that learning could be quickly captured, distributed, and replicated by managers. Hat color signaled organizational role, function, and rank, such that expertise could be visibly sought when needed. Both output and quality were constantly monitored via very

visible end-of-line whiteboards, factory floor computer terminals, and real-time reports to management and customers worldwide. If ever there were an organizational context in which existing practice demanded transparency, this factory in Southern China was the epitome, and management had implemented the best existing transparency tools with great diligence and success. I, in contrast, inductively explored the workers' behavioral responses, at both the individual and group level, to such stark transparency, while simultaneously controlling for any Hawthorne effects—circumstances in which subjects improve the aspect of their behavior being experimentally measured simply in response to the fact that they are being studied, not in response to any experimental manipulation (Mayo, 1933; Roethlisberger & Dickson, 1939). I use the resulting qualitative participant-observer field data introduced in this chapter, and the empirical field experiment it informed in Chapter 5, to challenge some of the current, blanket assumptions about the value of transparency for productivity and organizational learning and construct a contingent, behavioral model of the relationship between organizational transparency and learning, control, and performance.

FACTORY WORK

Over time, management scholars have demonstrated their love for studying factory floors by voting with their feet. In the decade from 1927 to 1936, approximately 20,000 workers were interviewed (and more were observed) by Elton Mayo, Fritz Roethlisberger, and their colleagues at Western Electric Company's Hawthorne Plant in Hawthorne, Illinois (Mayo, 1933; Roethlisberger & Dickson, 1939), which shaped the field of Organizational Behavior for at least several decades. In one of the most highly cited ethnographic studies in organizations, Donald Roy described his own experience working in a garment factory in New York (Roy, 1960). Roy also examined a machine shop in Chicago (Roy, 1952), the same site that became the basis for

Burawoy's Manufacturing Consent 30 years later (Burawoy, 1979). The tradition has continued with more recent studies of DuPont's rayon plants (Hollander, 1965), a GM factory (Hamper, 1986), Chinese cotton mills (Honig, 1986), a computer peripheral device manufacturer (Adler, 1990), the NUMMI auto factory (Adler, 1993), semiconductor factories (Bechky, 2003), a French aeronautical plant (Anteby, 2008), Chinese electronics factories (Chang, 2009; Ngai, 2005), and many others. Each study increases our understanding of factories as highly institutional contexts. As a result, with each study, unexpected results in factory settings become rarer.

I studied PrecisionMobile's 14,000-person, one-million-square-foot manufacturing facility in Southern China, situated within Precision's 150-acre industrial park employing over 65,000 individuals in 3.1 million square feet of manufacturing space. Spread across roughly two dozen factory buildings, Precision's employees produced everything from injection molded plastics to video gaming consoles for original equipment manufacturer (OEM) customers. At the time of this research, Precision was one of the three largest contract manufacturers in the world, PrecisionMobile (its global mobile devices division) was the second largest producer of mobile devices in the world, and the Southern China mobile plant was PrecisionMobile's largest, with a capacity to produce up to two million mobile devices per week, or roughly one out of every 25 mobile phones sold in the world. As a contract manufacturer, PrecisionMobile produced mobile devices to defined specifications for well-known OEM brands.

PrecisionMobile's management viewed transparency as absolutely essential to performance and survival. To achieve such large-scale manufacturing efficiently, PrecisionMobile simultaneously operated large numbers of identical production lines and implemented sophisticated systems and processes to ensure cross-line transparency for learning and

continuous improvement. PrecisionMobile's vision targeted "limitless scale managed by a system that delivers repeatable execution" (company materials). In the intensely competitive contract manufacturing industry, it was not uncommon for negotiations with customers over thin manufacturing margins to result in prices that assumed, without any direct evidence of feasibility, significant efficiency improvements during the ramp-up stage before the contract manufacturer could earn any profit at all. Therefore organizational learning and operational control within such "limitless scale" and "repeatable execution" were central to PrecisionMobile's survival (company materials). Given that mobile phone product lifecycles were steadily falling, with current models lasting only three or four months before being replaced by the next generation, the pressure for fast learning and tight control had only increased. When I first arrived at the facility, recent success stories included ramping up stable production of a new mobile phone model from zero to 96,000 units per day within four weeks for a tier-one OEM customer (the fastest ramp up ever completed by either PrecisionMobile or its customer) and shipping 36 million units of a different new mobile phone model (for a different OEM customer) in 36 weeks using production capacity distributed across four sites (China, Malaysia, Brazil, and Mexico) with total ramp-up time across all sites of only six weeks.

My contact at Precision was a board member who worked closely with me first to make introductions to select global executives and then to open the door for me to PrecisionMobile in China, PrecisionMobile's largest site and therefore the one that would provide the richest source of data. As each factory is run fairly autonomously by a local general manager (GM), the GM and his senior team in Southern China facilitated nearly all of my on-site activities, allowing me to keep my direct connection to the board and senior management less visible. I was introduced to the GM, the head of human resources (HR), and the head of operations as a researcher

conducting a study on transparency and human capital and was temporarily given nearly unlimited access to the site. I conducted two studies that involved data collection over the course of the next 18 months. The first phase of research involved a month-long inductive qualitative study with data gathered by three embedded researchers who were simultaneously operators on the factory lines and participant-observers for the study. In the second phase, I conducted a field experiment using an intervention and, again, embedded researchers to collect data on the factory lines, this time for the first five weeks of a five-month study.

EMBEDDED PARTICIPANT OBSERVATION

In a one-month preliminary visit to PrecisionMobile China, I adopted a special methodology to avoid contaminating the environment and the behaviors I was attempting to observe. My research team included three undergraduate students (two females and one male), all three of whom had been born and raised in China until at least the age of ten. The three students were inconspicuously placed on the factory lines as ordinary employees—only the GM, head of HR, and head of operations of the 14,000-person facility knew their true identities, which were carefully guarded. Given that PrecisionMobile experienced 6 percent monthly line operator turnover (the average for the manufacturing sector in Southern China), operators were constantly coming and going, and the integration of three new recruits was not out of the ordinary. As native Chinese born in regions that are common sources of the migrant workers who constitute nearly all of PrecisionMobile's workforce, the students' personal characteristics were typical of new recruits, and the extraordinary diversity of the migrant labor pool meant that the students' small idiosyncrasies and any potential lingual accents went unnoticed. As college students, the researchers' age approximated the age of the average recruit, allowing them to blend in.

PrecisionMobile's line operators were recruited from remote rural provinces to work and live at the factory. Most came from cities like Chongqing or Chengdu in Sichuan province or similar cities in Hunan, Hubei, and Canton provinces, while a smaller number came from the northern regions like Zhengzhou or Kaifeng in Henan province or Taiyuan in Shanxi province. Line operators were 72 percent female, 28 percent male, and 74 percent were 20 to 30 years old, 14 percent were 18 to 20 years old, and 12 percent were over 30 (Table 2A). Line operators, who operated machinery or worked in assembly and packaging on the factory floor, and their direct supervisors (line supporters and line leaders) accounted for 85 percent of the employees and are considered direct labor. The remaining 15 percent of employees, including engineers, technicians, and senior managers like floor heads, are considered indirect labor. Indirect labor tended to be a bit older—69 percent were 20 to 30 years old, 27 percent were over 30, and four percent were 18 to 20 years old—and included more men (59 percent female, 41 percent male). On the factory floor, however, uniforms consisting of antistatic scrubs, shoes, and hats masked most demographic differences. As a result, with the exception of proximate individuals, other employees were most easily identified by their hat color (e.g., white or brown for ordinary operators, blue for line

Table 2A: Attributes of the Population Studied

Operator (Direct Labor)	Gender	Female: 72% Male: 28%
	Age	Below 20: 14% 20-30 Years Old: 74% 31-40 Years Old: 11% Above 40: 1%
Indirect Labor	Gender	Female: 59% Male: 41%
	Age	Below 20: 4% 20-30 Years Old: 69% 31-40 Years Old: 25% Above 40: 2%
Common Attributes	Home Region	Operators were recruited from remote rural provinces to work and live at the factory. Most came from places like Chongqing or Chengdu in Sichuan province or Human, Hubei, and Canton. A fewer number of workers came from the northern regions like Zhengzhou or Kaifeng in Henan province or Taiyuan in Shanxi province.

supporters, yellow for line leaders, light blue for engineers, hot pink for quality control, light pink for floor heads), scrub color (e.g., white for operators, navy blue for technicians), or colored badges (e.g., trainees wore red armbands, materials operators wore blue armbands).

Because the behavioral questions I sought to answer concerning the impact of observability on performance were open-ended, this research phase was structured inductively, with the research team entering the field with the open mind characteristic of grounded theory building (Glaser & Strauss, 1967) in the qualitative tradition of embedded participant observation (Ehrenreich, 2001; Ely & Thomas, 2001). Prior to arrival, the three "embeds," who each had at least two prior courses in qualitative methods and some qualitative research experience, were trained in how to properly collect field notes (Emerson, Fretz, & Shaw, 1995) and the basics of the participant-observer craft. The training focused specifically on how to take both an appreciative and skeptical stance, distinguishing the "multiple truths" they would record while immersed as an active participant-observer (Mishler, 1979: 10). Upon arrival, embeds lived with and like those whom they studied: they were put through the PrecisionMobile orientation and then put onto the line just like new hires, living in the factory dorms, eating at the factory cafeteria, and working on assembly lines producing mobile phones at stations assigned to them by floor heads and line leaders, who were unaware of their status as embeds. After the introductory field visit of eleven working days on the lines, in some cases for as long as twelve hours per day, the team had already collected qualitative data, including transcripts and supporting materials, reflecting approximately 800 hours of observation in total.[1]

[1] For adequate protection of human subjects (IRB Approval #F16225-101), only four individuals—the three embeds and I—were authorized to access data with individual identifiers. As per the IRB approval, "a deidentified data set of factory line observer comments [was] created as soon as practicable, for analysis purposes," prior to sharing any results with anyone

As my presence on the factory floor would have contaminated the study, I limited my factory floor visits to times when other foreigners were also on the floor, approximately twelve hours every two weeks. Otherwise, while the embedded operators were on the line, I waited in an isolated office on a separate floor, where the embeds would come to record their observations with digital audio recorders during breaks: 40 minutes every four hours, with occasional ten-minute bathroom breaks in the interim. To maintain the freshness and purity of observations, as well as to make the most of the time provided by short breaks, the embeds recorded their observations verbally, and I then transcribed the recordings while they returned to work on the lines. After daily production finished, we recorded any remaining observations and reviewed the day's transcripts as a team, giving the embeds a chance to confirm or challenge each other's perspectives.

Although this research design was born of necessity from my inability to fit in, the separation of researcher from participant-observer offered two other advantages. First, by forcing a disaggregation of the participant-observers (embeds) and the integrator (me), the research design helped to enforce discipline around entering the field with an open mind (Glaser & Strauss, 1967): the embeds were not instructed to look for anything but simply on how to look. Only through transcribing their observations, coding them, and discussing them afterwards did we integrate observations into theory. Second, consistent with the tradition of participant observation in industrial contexts, data in this context took full advantage of the embeds' dual role, consisting of both what was observed and the embeds' own observations (Ellis & Bochner, 2000; Ellis & Flaherty, 1992). In the former case, embeds reported distanced observations of

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(including the board member who granted us access). Anonymity was practical only because of the size of the site: with 65,000 employees, it was quite easy to remove individual identifiers with no possibility of later discovery by management.

factory floor activity; in the latter, to borrow terminology from Sanday (1979), the embeds were themselves "instruments" of the research, their reactions to factory floor interactions capturing observations that might otherwise go unnoticed.

At the end of the month, the researchers revealed their identities in debriefings held at their daily line meetings, permitting them subsequently to administer a survey of their end-to-end assembly lines and conduct in-depth exit interviews with several workers with whom they had built a high level of trust.[2] For this phase of research, data include the embeds' transcribed participant observations, the assembly-line survey results, recorded and transcribed exit interviews with operators, and additional data about the site (e.g., workforce demographics, performance metrics, compensation structures) requested from management. Quotations were of three types: verbatim quotations from operators recorded during the exit interviews, operators' discussions reconstructed by the embeds during their breaks; and embeds' observations recorded during their breaks. All raw data in Mandarin were subsequently translated into English by the research team. I analyzed the transcripts according to grounded theory guidelines (Glaser & Strauss, 1967; Miles & Huberman, 1994), using open coding techniques and qualitative data analysis software to track the content of recurring themes. As themes emerged, the research team met to discuss the emerging themes and fine-tune our shared understanding of the transcripts.

[2] Operators' responses to the debriefings were surprisingly positive. In each case, one embed was placed near the debriefing so that the embed could observe the reactions of the other embed's fellow operators. On one line, the operators applauded for the embed, as if one of their own had just been admitted into university. On another, the embed in the audience heard the operators whispering that they did not "believe that [the embed] was really a college student" and actually laughed at the prospect.

UNEARTHING THE TRANSPARENCY PARADOX

Hiding in Broad Daylight

During this first phase of the research, it became clear almost immediately that operators were hiding their most innovative techniques from management so as not to "bear the cost of explaining better ways of doing things to others" or alternatively "get in trouble" for doing things differently. One of the first rules in which my researchers were trained by peers was how to act whenever a customer, manager, line leader, or any other outsider came in sight of the line. First the embeds were quietly shown "better ways" of accomplishing tasks by their peers—a "ton of little tricks" that "kept production going" or enabled "faster, easier, and/or safer production." Then they were told "whenever the [customers/managers/leaders] come around, don't do that, because they'll get mad." Instead, when under observation, embeds were trained in the art of appearing to perform the task the way it was "meant" to be done according to the codified process rules posted for each task. Because many of these performances were not as productive as the "little tricks," I observed line performance actually dropping when lines were actively supervised, a result I began calling a reverse Hawthorne effect because productivity fell, not rose, as a result of an observer. My embeds' privileged role as participant-observers, along with the substantial hours of research time on the lines, allowed me to collect numerous examples of these productively deviant behaviors, the performances that were used to hide them, and their antecedents, across categories of tasks. Table 2B provides a selection of examples. Meanwhile, suggestion boxes on every line remained empty with, as one operator put it, "rust in the locks."

Table 2B. Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

Task	Process when observed	Process when unobserved	Operator rationale for productive deviance	Training
Attach protective chip covers with unique, identifying bar code stickers	"The correct way would involve using both hands to remove one label from the roll, picking up a lid, taking out a board from the rack and then setting it down and putting the cover on with both hands. Then you need to set the board down, pick up the roll and repeat that process three more times. Finally, you have to put the board back onto the rack. After the whole rack is done, then you have to take each board out to scan into the computer." (Embed, based on the total quality control (TQC) chart)	"My job and my trainer's job was to take these stickers that were given to us, keep a record of how many stickers we got, keep track of the numbers on those stickers. We take logs of those. Then we scan every single one of those stickers into the system and . . . put each sticker onto these little metal casings. The metal casings come in big trays of 64. The other two women, the women from Sichuan, would stack all of the boards that they had checked in a shelf-like thing in groups of 15, and I would take those boards and put the casings with the stickers on." (Embed)	"The short cut is significantly better because, first, all the bar codes can be applied with one hand at an amazing speed. At least four times faster than if you were to apply one by one. Second, it is ten times easier to scan when all the bar codes are aligned on the roll [of stickers] than already on boards--we don't need to flip the boards, and we save time otherwise lost to aiming the laser (UPC reader) correctly. Third, we take the boards off their racks only once instead of twice (i.e., first time to apply the covers, second time to scan)." (Embed) "If you didn't do it their way, they say you didn't follow the rules and you should do it their way. If we follow their rules, there would be a whole lot piled up and they would complain about us being so slow. If we tell them that this is going to pile up doing it their way, they'll say that they will just add one more person, and if there are two people at a station, then there won't be enough to do, so we'll be standing around a lot, and so they'll come and complain." (Operator)	"Basically, she [the floor head] took me to the line and told the line leader that I was being put into their line. Nobody questioned that or said anything, they just said okay. And then she randomly picked out this one girl who was standing at the end of the line and said, 'Are you putting covers on those boards?' and she said, 'Yes.' And then the floor head said, 'Take off your training badge and give it to JH, and teach her everything your teacher taught you.' And then she left and my day started." (Embed) "This morning when I was putting the lids on, my trainer told me to do it their way, as told to me yesterday by the . . . pink hat. So I put the lids on, and then put the barcodes on. I asked her why we were doing that, and she said: 'Well, she's hovering around. If we're not busy, we'll do it her way so we don't get yelled at again, but if we do get busy, then we'll go back to doing it our way.' And if we do it their way, it does create two more procedures and is a lot slower." (Embed)
Manual inspection of printed circuit boards (PCB)	"We were supposed to look at the board and the model, compare, and if it matched, put the cap on." (Embed)	"The others were trying to teach me how to check two cell phones at the same time, which I don't think you are supposed to do. The girl was all for it, because then I would be faster and she would have less to do, but the guy said, 'No, she's new, you don't want her messing things up,' so I didn't do it." (Embed)	"Faster, less taxing production." (Embed)	"Some lady just came around and said 'Oh you guys got a new person?', they said 'Yeah,' and she said 'Be nice to her, teach her well, be very detailed, don't teach her all your bad habits, teach her the right things' and everybody laughed." (Embed)
Protective gloves	"Everyone on the line is supposed to wear gloves on both hands and/or rubber fingertip covers." (6S Rules)	"People usually wear their gloves in their own ways—either they wear a glove on only one hand or they cut their gloves so their fingertips stick out, giving them a bare hand or bare fingertips so when they are doing little things it goes a lot faster." (Embed)	"Not all tasks require protective gloves—the management just do that for show. And for tasks that don't need gloves, production goes much faster and more effortlessly with bare fingertips." (Operator)	"Once when the customer came, people were passing around the word, so they all changed gloves. So you could then see that everybody was wearing a full pair of gloves. And then once the customer was gone, they just went back to the way they were wearing them before." (Embed)

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

Line operator allocation	"Each station is allocated one operator." (Management)	"I counted today—on the backend portion of the line, we had 17 people and 13 stations on our line today." (Embed) "There are many stations that are supposed to be managed by one person, but in fact we have to put an extra operator at each of those stations in order to get work done. These stations are the engraving / accessories, boxes / sticker, and away-from-line jobs (putting instruction and cables in the boxes). All of these stations are supposed to only be operated by one person, but we assign two at each one every day. When management comes around and check, we have to get the 'extra' operators away from the line so not to be discovered." (Line supporter)	"They expect us to finish so much in so little time. We need these extras to actually meet the target. Think about it, when they increase our units-per-hour (UPH) targets, the kaizen engineers, supporters, and line leaders come and help us with production. Once we reach the target, they all leave. For that UPH to be sustainable, we sometimes have to have extras. The total quality control (TQC) charts say that each station can only have one worker, but what's wrong with people helping each other when they have extra time? But these things we need to hide from the management." (Operator)	"The floater took us along with four others to the end of the floor. She explained that someone is coming to visit the lines, and because we are the new workers, we are the 'extra people' on the lines and need to be taken away. She took us to this rest area and we were supposed to stay there as long as that important someone is still around the lines. Someone asked the floater again why we had to leave, the floater said, 'We really are only supposed to have 4 people on each line, but there are about 6 people on the lines, obviously more than necessary according to the rules.'" (Embed)
		"There was the first girl, then the second girl, and then me. And the second girl said to the first girl, 'Why are you working so fast? You've got to wait—I'm not keeping up.' And then the girl did slow down. Because they don't want there to be a lot of 3G data cards on their table, because that looks bad for them." (Embed)	"Because each station is only supposed to have one operator, they cannot help each other when they fall behind, at least when someone is watching—instead, they have to slow down." (Embed)	"I had put so many boxes on my table, so it looked a little messy, and the girl right next to me poked me and told me that I need to clean it up . . . otherwise, the production leader is going to yell at you.' So I started putting things back . . . and the production leader came over and told me, 'Don't accumulate this many boxes on the table.'" (Embed)
Line reporting	"In front of each line, there is a production status indicator and a whiteboard with the hourly production (targeted and completed) for the shift. It also includes reporting for any quality failures (rejects) on the line." (Floor head)	"What I thought was really strange is that there was a chart in front of the line that's supposed to say how many you have produced this hour and what your goal is, and she updates that every hour. And I thought it was very strange the numbers are perfect, everything was 100% —it was just perfect. I asked the operator writing on the board where she gets her data from, and she said she gets it from the guy at the last post in the line. He makes the final check on the phone and scans the barcode into the computer. And he keeps track of how many boards he puts out. . . . And he definitely verbally tells people when we aren't producing enough. He would say: 'Hey, speed it up.' Or 'Hey, slow it down.'" (Embed)	"I have a feeling that he tampers with the numbers, because only 2 days ago, I was one station away from him. I don't think he's actually counting them one-by-one, I think he controls the numbers throughout the day—sometimes they produce more, sometimes they produce less. Our blue hat always writes down 240. And he never . . . I actually pay attention to what he does . . . he never actually looks at what it says on the Precision IT screen. He just notices that it's about the right time—let's say it's 9:56—and he will write down for the block from 9–10 that we made 240." (Embed)	"When I asked [the operator writing on the reporting board] about the validity of the numbers, he said, 'If the actual doesn't equal the target, then managers will come over to complain. But overall, we're on time, aren't we?! We never fail to have enough at the end of the day—we always meet our goals.'" (Embed)
Putting leads on the printed circuit boards (PCBs)	"I was doing it kind of slowly, carefully, and gently." (Embed)	"She [my trainer] is a lot rougher on the boards—she takes them over and flips them around quickly, I do it slower and I use two hands to do it." (Embed)	"We need to be able to work fast under pressure, when necessary." (Operator)	"She said 'don't do that… right now you are fine, but when you have boards piling up, you are never going to finish it, you are going to be under a lot of pressure, you need to practice now being really fast to do it. Like this: one hand here, two fingers here, flip….'" (Embed's Trainer)

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

Backend assembly and packaging task design	"The facility is designed for three second takt times, meaning each task should be three seconds long." (Senior management)	"Their tasks were definitely not completed in three seconds. In fact, I counted—it was more like four-five seconds. And each task was different. It takes (one… two… three… four… five… six…) seven to ten seconds for my trainer and longer for me." (Embed)	"Better motion, less fatigue, faster production with the same resources." (Embed's trainer)	"If someone is having build-up, they would call someone from down the line to help." (Embed)
	"I have a feeling that since there is one total quality control (TQC) chart for the station, each station is designed to need only one person." (Embed)	"But for all of those things that are being tested, there are three people there and they sort of divide all the tests among themselves. It's very fluid." (Embed)	"Faster reduction of bottlenecks." (Embed)	"If one person is having too many, like today we were about to get up for lunch and everybody was hurrying and the girl left for the bathroom or something so I had a couple piled up on my side, and then everybody just helped so we can finish and leave." (Embed)
	"Put the cell phone in the box, scan the box, and pass it along to the next person." (TQC Chart)	"After I stood there for 10 minutes, she started grabbing the phone, scanning it, and automatically giving that phone to the person next to her (without putting it in the box), and I don't think she was supposed to do that. But it speeds up the process for the girl next to her, because she gets the phone earlier and she can put that in the plastic bag and just wait for her box which she puts the sticker on." (Embed)		"Especially when they've worked on one station for a long time, they tweak the steps here and there and find a faster way of doing it." (Former line leader, training manager)
Testing	"I'm supposed to be testing the cell phones. I'm supposed to plug in both headphones and talk into the cell phone to test whether the headphones work—if I can hear stuff." (Embed)	"For convenience sake, I usually only use one earbud, and that was the way I was taught, that's the way my trainer does it." (Embed)	"Because with only one earbud in, you can just unplug it, and immediately listen to the cell phone in the other ear to test the speaker on the phone itself."	"Then the yellow hat [line leader] came around and I was doing that [testing with only one earbud]. After the yellow hat left, my trainer said, 'Didn't I already tell you this?! Every time the yellow hat comes, you need to test with both ear buds. You talk into the cell phone once and listen to the left earbud, and then you talk into it again and listen to the right earbud.' And she said, 'when the yellow hat isn't there, you don't need to do it, but you should do it every time the yellow hat comes around.' And then the guy next said, 'oh, so you're teaching her all of the bad habits, eh?' And she responded, 'so what, you taught her how to not do the keys one-by-one, you told her to just run her fingers across the board.'" (Embed)
	"We were supposed to test for the keys, we were supposed to press them one by one and see if the correct numbers register." (Embed)	"The guy that was teaching me would scrape his hand like this across the keys, rather than pressing them one by one. So I learned it that way. So I was doing it that way and then little bit later, he turned around and he was like: 'oh don't do it that way, that's not the way you are supposed to do it, don't do it like me, you're going to get yelled that.' He said: 'I am going to teach you the right way, you are supposed to press them one by one and if you choose to do it my way, that's your choice.'" (Embed)	"Being a quality assurance (QA) operator, I see what the process is like on the line, and I see these documents that clearly state how things should be done, but they're not followed because they want to hit the production mark before anything else. 'We need to rush production!' I hear that a lot." (QA)	
Line appearance	"Lines are always supposed to be busy." (Floor head)	"In reality, there is a lot of downtime—for maintenance, because of a problem, because you are waiting for materials, because you are waiting for paperwork… there are lots of possibilities." (Embed)		"There were some foreigners today walking around, and because we were doing maintenance, there was nothing to do. So my trainer told me to take out the graphs and pretend to look at them. She told me in the morning—'I think there are

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

				customers coming. If they come, you take out this graph, and you hold it like this, and you pretend that you are checking the graph with the boards, okay?!' And so I responded, 'ok.' And I think I was leaning on the table at the time, and my trainer leaned over and whispered to me, 'stand up straight!' So I did what she said and stood up straight and stared at the log book, like she was doing." (Embed)
Circuit board automated production (SMT)	"SMT [surface mount technology] machines are very complicated and involve the most expensive materials (the chips). When an SMT machine breaks down, you are supposed to call an engineer for help and wait until he arrives." (Embed)	"This morning, in one of the machines, one of the circuit board for some reason fell out of where it was supposed to be. My first trainer just opened up the machine cover and put one foot into the machine to retrieve the circuit board. I thought that was interesting because they didn't bother to tell the blue hats or the engineers before she did that." (Embed)	"Keep production going" (Embed)	"I've learned much of the stuff that engineers do by watching them do it. It's not hard." (Operator)
	"Around lunch, the SMT machine I was working with broke: one of the components [line operators called it 'worm'] could not be sucked by the machine correctly. So my trainer asked one of the engineers for help." (Embed)	"While waiting for the engineer, my trainer checked the machine for a while, but she couldn't fix it herself. In order not to slow down the production rate—because today we had a specific goal of how much we need to produce—my trainer started the machine and stopped it frequently to put the materials that the machine failed to suck in back to the reels, so that these materials didn't get wasted. The engineer did not like the way my trainer did it, he asked her not to do it. And my trainer was annoyed, retorting back saying, 'you can't even solve the problem, the machine is still broken.' The engineer and my trainer didn't talk for a day afterwards. They used to flirt and joke with each other a lot." (Embed)	"Once these machines are broken, we will have to delay our production and often times we can't hit the target. However, the management above us won't give us a chance to explain the delays, so we never get permission to reduce the production goal for the day. As a result, we need to find ways of catching up with the missing productivity due to machine problems all by ourselves." (Operator)	"Since some of these engineers have only been on the floor for a few months, they in fact ask us how to fix it." (Operator)
Automated optical inspection of completed PCBs	"Boards are inspected optically by an advanced machine to make sure all of the chips are in exactly the correct place after being placed on PCBs by the SMT machines. When an error is detected, the machine sounds an alarm to the engineers and waits for their attention. If the engineer inspects the board and all appears okay, then the error is in the inspection software, and the engineer clears the error by pressing 'Esc' on the keyboard." (Engineer)	"Engineers rarely come quickly enough, so operators handle it themselves. When multiple boards trigger the alarm, they inspect the first one, and if it is okay, they assume subsequent errors are also software-related and just press 'Esc' over and over to clear the errors and avoid a stop in production." (Embed)	"It doesn't cause any problems, and it keeps production moving." (Operator)	"We just do what the engineers would do—we hit Esc if everything is fine." (Operator)
Electrostatic discharge (ESD)	"At designated stations, we were supposed to work on this surface that reduces static electricity and/or wear a	"When I was working today, my trainer said, 'You're too slow. Don't work on the ESD surface. Instead just work on top of the tray that	"Keep up with production speed of co-workers." (Line leader)	"I'm not quite sure if she's actually a trainer, but perhaps just a random person on the line. But I think that is

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

prevention	bracelet connected to the workstation that keeps the operator grounded." (Embed)	keeps all the little covers.' So I did that. And later on, my trainer told me: 'whenever the customers come around, don't do that, because they'll get mad.' And I asked her what the customers look like, and she said, 'they wear blue robes, and they're the only ones that wear different color robes, so just look out.'" (Embed)		a good idea—it was her post that she was teaching me now, so she has all these little tricks, like putting the board on the tray instead of on the table—that really does speed things up. I'm a lot faster now." (Embed)
		"What I thought was really interesting was that the pink hat [line supporter] also disobeyed rules. She needed an ESD bracelet for one of her posts, and she didn't have one with her, so she asked some guy in the line—'hey, can I use your bracelet?' Obviously, if the guy has a bracelet, he needs to use it, but she knows that he doesn't use it, so she took it from him. And he said, 'hey, I still need that'… but I don't think he was serious about it. And she replied, 'okay, if anyone comes to check, I'll give it back to you, okay?'" (Embed)	"Better mobility around the line." (Embed)	"They gave a little sheet of paper, and I was supposed to memorize it. It's kind of ironic—it's a sheet of paper about static electricity and how to avoid it, the ways of taking care of it. But at the same time, the operators are not using the ESD surface and bracelets." (Embed) "And when I was doing the tweezers thing, the girl asked me if I had a blue wristband—the thing that takes static electricity away from you—and I said I didn't, should I go ask for one? She said, 'no, you don't have to, it's just that someone is coming over to check, and I don't know if she's going to yell at you or not. That's the only worry.'" (Embed)
Materials / kanban	"Materials are brought to the line in volumes that do not exceed 1 hour of production--or, in some cases, two. The line production pulls materials; the materials people do not push line production." (Embed, based on training materials)	"Our job is to make sure that production is normal and the line doesn't stop. Basically, you deliver your materials, try to do it efficiently and try to do it fast, try to get yourself on a schedule, be smart—see ahead of time how much they need. So your job is easier, and you don't want to mess up anything, because if you mess up on something, the whole day you are behind and you'll always be running around. So, basically get yourself on a schedule and besides that, you stand over here in front of the kanban store for a while, look like you are doing something, and then stand on the line for a while and look like you are doing something, check underneath the tables, collect garbage once in a while, and then there you go, you repeat the process again, you scan the codes, you get the paper and you get the materials and send it out." (Materials operator)	"Because if you look at this from a materials point of view, you would want to give out as much as possible, so you don't have to make multiple trips and keep on giving them, right? So that's what they try to do and that's the limit that they try to push." (Embed) "One other reason why they don't keep kanban, especially with smaller materials like stickers, domes, or LCD screen glass covers, is that those materials are small, and they come in packages of let's say 1000 or 500, and if UPH requirements are 300, it makes it very difficult for them to open up the package and only send in 300." (Embed)	"I was asking my trainer, 'why do they even have this kanban stuff? Why do we have to add material according to UPH?' And she replied, 'personally, I think that the bigger materials, perhaps if they control UPH, there is a reason – so we don't crowd out the tables, so we don't have too many materials piled in the tiny moving area, because the lines are really cramped. You know about 6S, right? So it doesn't look messy. But the smaller materials… they just want to create more work for us, when they control the smaller material.'" (Embed)
		"The materials handlers have a ton of little tricks that they do that they are not supposed to do." (Embed) "She also knows all of the tricks of putting the stuff into the shelves so that it doesn't look like a	"The materials trainer told me, 'all the rules are dead, but people are alive. We can't be stupid and follow those stupid rules. Because when people first get on the floor, production is usually really, really slow; in the middle of the day, it	"We need to keep kanban, that one I'm not even going to say again. I know that's not going to change anything, but I still have to say this." (Senior manager)

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

		lot. She always said, 'ok, so you put the lenses in a pile in a box and fold it like this, so it doesn't look like a lot. And if you're trying to put the paper boxes, you stack them like this so it doesn't look like a lot.'" (Embed) "Also, later on in the evening, just before we were supposed to get off work, my trainer made a mistake. Somehow, the UPH plan chart that she got was much different from the UPH chart that the line got. So she ended up working according to her chart, and kept on asking for materials and kept on sending it to the line. But then, pretty soon she realized that they still had a lot of materials, and she was sending way too much. She could not send it back to kanban store, because they wouldn't take it back. And they are not allowed to keep stuff on the shelves in front of the kanban store, because people actually check that, and during the meeting the pink hat said, 'you shouldn't keep things there for too long – more than an hour is really ridiculous.' So what she did is—there were empty lines around the area that weren't being used, so she stuffed all of her extra materials into the shelves, in some corner where no one is going to notice. And said, 'ok, we'll just hide this stuff here for a day, and then tomorrow, we'll use it.' And apparently, she does that quite frequently if there is too much material." (Embed)	peaks; then, right when they are about to get off, things slow down again. It's all up to the materials person to really get to know the line, and get to know the pace, and control it that way. You can't say, 'one hour, it must be xx number of parts.' Because then materials will pile at the beginning and right before break, and they will definitely run out during the middle of the shift.' And having worked on the line, I know that's definitely true." (Embed) "I think they do recognize that people check for kanban. That's why they say the smaller materials is okay, we'll stuff it in the box so nobody will see… well, that's true. You've seen how close, there are so many things going on. If this tiny pack of tiny little stickers, if you stick it somewhere, nobody is going to see that." (Embed)	
	"When a line changeover occurs, all materials are supposed to be returned to the kanban store for re-cataloging." (Senior manager)	"And in the middle of the day, his line changed model. They took all of the materials from the line, except they didn't put it back in kanban, because apparently there's another line still making the same product. So instead, there's a tiny room, I think it's a kanban store kind of place, and they put everything in that room. So it's all half-used materials, packages are open, etc. So my trainer took everything from that room the next day until the leftover materials had been used." (Embed)		
	"When materials people collect the garbage of the line, they first make sure that no materials are left in the packaging. Then, when they throw out the garbage, they are supposed to check again with a guard watching." (Operator)	"And when we actually go dump that stuff, we are supposed to dump it one by one and check if there is no material left, and she did that the first time because there are security guards looking, but then later on the security guard wasn't there. So she told me: 'you are not supposed to do this, but if the security guard is not here, we don't have to look because we already looked on the line.'" (Embed)	"When we've already checked it once, there's no value to checking again. It's purely a waste of effort." (Operator)	
6S	"There are very strict hygiene rules for	"6S guidelines are not really followed. Operators		"When I was in B11, one of the

Table 2B (Continued). Selected Examples of Hidden Variance on the Lines (Quotes from Operators and/or Embeds)

(Sort, straighten, sweep, standardize, sustain, safety)	the factory floor, which are consistently enforced through training, workflow design, audits and surprise visits by 6S teams." (Site training documents) "And of course on the workspace there's tape clearly labeling that you're supposed to keep the records there: keep the good ones there, the bad ones here, records here, etc." (Embed)	do whatever they feel like. But when they were doing a maintenance, and there's talk of people from above coming to look, everybody was cleaning. We had to wipe the tables, pick up crap from the floor, we did open the oven and wipe it down with alcohol." (Embed)		customers was coming, and the entire day was spent on cleaning, and it was like new year's! But usually, it's never like that. They make it such a big deal." (Embed) "I also saw a few white hats chewing the gum we got at lunch while working. I asked the girl on my right if I could chew gum, and she said, 'oh yeah sure, just make sure after you finish it, wrap it with the working paper (like those papers for reporting quality and quantity) and then throw it in the trash bin, this way people can't find out that's actually gum.'" (Embed)

The gap between observed and actual behavior was intensified by the fact that these workers, though unskilled, were by and large "very clever and driven," according to the embeds' observations. As one of my researchers proclaimed, "If they want to hide something from you, they will succeed." In a conversation after a line visit by a global manager, one embed seized the opportunity to ask her fellow operator and trainer about this hiding behavior. In her response, the operator referred to it as the "privacy" operators needed to keep production moving sufficiently smoothly to meet ever-increasing management targets. The research team, which had not used the term prior to that worker's comment, adopted the word in turn.

The qualitative evidence of hiding behavior to maintain privacy was prevalent in the transcripts. In fact, although they hid it from others, workers were very open with their peers about it and described it in great detail with the embeds during the exit interviews. The embeds even observed lower-level line management ("line supporters") helping operators maintain privacy, as the supporters often warned, "Hey, you're doing [this] . . . don't do that when [so and so] comes around!" and would let them know when management or other observers, such as Six Sigma (6S) auditors, would be within observation range, much like the account by Dalton (1959). Because the materials team was the most mobile, materials operators were important in providing warning signals, and one embed described her materials operator as the line's "CNN." The materials team always seemed to know what was going to happen before it did.

Ironically, the extremely high level of visibility across the factory floor was perhaps the most important enabler of this behavior, as lines could see managers coming long before they arrived. The research team called this "*double-sided transparency*." As one line operator put it, with what the embeds understood as well-meaning intentions, "Of course we prefer that the managers wear different colors and are easy to spot. That way, we know they are coming. Otherwise, you can't

even prepare for their arrival." Visual factory tenets, intended to enable operators to seek needed expertise (Greif, 1991), were instead enabling hiding behavior.

Informed by these data, a bird's-eye observer of the floor could indeed observe bubbles of less productive behavior surrounding any outsider walking the lines, like the "personal bubble" from privacy described by Foye (2008). With the benefit of the embeds' experiences, behaviors that had previously been quite hidden were relatively easy to see as long as you were not one of the individuals from whom the behavior was intended to be hidden. In most cases, the hidden behavior involved doing something "better" or "faster" or to "keep production going," often by engaging in activities that operators claimed were "not hard" and had been learned by "watching [others] do it," a form of tribal knowledge on the factory floor. What operators described as "their" [management's] way of doing things often involved "more procedures" and was "a lot slower," whereas the improved, more "fluid" methods were necessary to avoid complaints from management about the line "being so slow." In an operator's words, the deviance doesn't "cause any [quality or safety] problems and it keeps production moving."

Such private deviance in workplaces is common, well documented (Anteby, 2008; Burawoy, 1979; Mars, 1982; Roy, 1952), and comprehensively inventoried in a recent handbook on misbehavior in organizations (Vardi & Weitz, 2003). What made the deviance in this context so interesting is that so much of it appeared to be productive for line performance—and that such productive deviance existed even though the workers, who were paid a flat rate by shift and not piece rate, had no financial incentive to enhance performance. A shift's quota was set by production managers for clusters of similar lines based on demand for the products being produced, and performance expectations (e.g., the number of defect-free devices produced per hour) were based on a combination of engineers' pilot testing of lines during the initial ramp-up

of that product's production and an assumption of learning over time, based on previous PrecisionMobile experience with similar products and tasks. Exceeding expectations resulted in waiting time, standing at the stations, at the end of a shift, but there was little more positive incentive than that. Nor did negative incentives, such as disciplinary methods or penalties, explain the productive deviance. When lines failed to meet performance expectations, traditional Toyota Production System or TQM methods—poka-yoke, in-station quality control, jidoka, five why's, kaizen, small group activities (SGA), Ishikawa fishbone diagrams, among others—were employed to find the root cause and correct the error. Discipline of individual operators could range from simple warnings to removal, but though the embeds witnessed a few warnings, they witnessed nothing more significant than that. In contrast to several other large contract manufacturers in the region, PrecisionMobile had a reputation among the workers for being one of the best local places to work, and at least one operator cited fairness in discipline as part of the reason. Nothing we witnessed about the incentive structure explained the workers' motivation to be productively deviant. Although the factory was located in China, its management systems and approach were quite standard globally or what the company called best practice. On visits to similar PrecisionMobile facilities elsewhere in the world, I found that the systems were nearly identical.

When the embeds casually probed operators about their motivation to hide productive behavior from management, operators' most common first response involved a perceived lack of capability on the part of management, particularly middle management: "People from above don't really know what they are doing. They set all these rules, but they have no idea how it actually operates down here. Sure, process engineers time these things and set all of these requirements, but they have no idea how people operate." When the embeds pushed a bit harder,

suggesting that one reason that management might have "no idea how it actually operates" was because operators were actively hiding it from them, they received a consistent response: experimentation and the communication of new knowledge to management was costly. As explained by a nine-year veteran of the factory who had worked her way from ordinary operator to line leader and now to a training coordinator in the HR department,

> It's easy for workers to find something that works better. They have very valuable input. As someone who is in close contact with the line, I know what works well. But when you tell others, they'll say, "How do we know how much value this has?" We don't have the kind of data they want, and we can't make a case for our findings.

For an operator, successfully transferring knowledge highly situated in his or her task first required transforming that knowledge into common language (Bechky, 2003), namely, data-driven analytical language that spanned organizational divides between roles (management or operator), functions (engineer or operator), training (skilled or unskilled), or tasks (line designer or line operator). But for an operator in this facility, busily doing one set of tasks 2,400 times per shift, it was far less costly to hide that knowledge than share it—keeping it private meant, in one operator's words, "Everyone is happy: management sees what they want to see, and we meet our production quantity and quality targets." Line leaders, who had to manage across this divide in understandings, described themselves as having the hardest jobs, needing to "make the impossible possible." But as one line leader told us, the best line leaders did so by always "keeping one eye closed and one eye open"—maintaining a privileged position of awareness on both sides of the privacy boundary while being careful not to pierce it, for fear of the negative performance implications of doing so. When line leaders were with supervisors, they pretended not to see the productive deviance; when surrounded only by their team, it was okay for them to quite obviously observe it. As one line leader put it, "Even if we had the time to explain, and

they had the time to listen, it wouldn't be as efficient as just solving the problem now and then discussing it later. Because there is so much variation, we need to fix first, explain later."

Privacy and the Reverse Hawthorne Effect

The participant-observers' experiences at Precision were not consistent with prior theory that transparency enables performance. Instead, transparency appeared to *keep* operators from getting their best work done. The operators' choice of the word "privacy" went to the core of my observations of these behavioral responses to transparent factory design. Mechanisms for achieving transparency not only improved the vision of the observer but also of the observed, and increased awareness of being observed in this setting had a negative impact on performance, generating a reverse Hawthorne effect. The qualitative data collected at Precision suggested that the reverse Hawthorne effect went beyond passive social facilitation effects (Bond & Titus, 1983; Zajonc, 1965) to something more intentional and strategic, thus necessitating a look at the full implications of what the operators referred to as the need for and value of "privacy" on the factory floor.

Chapter 3: A Brief History of Transparency and Privacy
What Happens in Vegas No Longer Stays in Vegas?

"Man, we are repeatedly told is a social animal, and yet he constantly seeks to achieve a state of privacy."

R. Ingham (1978: 45)

To enhance others' performance, when should we observe others, and when should we not? To enhance our own performance, when should we be observed, and when should we not? Despite the logical need for congruous answers to those two sets of questions, centuries-old literatures on transparency and privacy sufficiently contradict each other to permit thriving yet inconsistent answers. The result: the human tendency for desiring more observability of others than ourselves endures (Lazarus & McManus, 2006: 924–925), in place of a more scientific answer, simply because one literature lives in the management sciences and the other in philosophy and law. Theory has therefore not benefited from the identification of tradeoffs that comes from integration and ultimately permits resolution. The field of organizational behavior, given its history of transforming loosely connected literature into performance-based theory, is well-suited to the task, drawing on a full understanding of the transparency and privacy literatures, incorporating related research in operations, innovation, strategy, political science, and creativity, and using a lens focused on performance across levels of analysis. In doing so, this chapter sets the stage for the PrecisionMobile field experiment described in Chapter 5, and the development of an attention-driven view of organization productivity described in Chapter 6. Such an effort offers the promise of a comprehensive and nuanced theoretical perspective on transparency and a grounded answer to the question: does privacy make groups productive? The first step is to understand what the workers meant in referring to the hiding behavior as "the privacy we need to get our work done."

Privacy, or the ability to limit physical, interactional, psychological, and informational access to the self or to one's group (Altman, 1975; Burgoon et al., 1989; Parent, 1983; Schoeman, 1984; Schofield & Joinson, 2008; Solove, 2008; Westin, 1967), has often been framed as a basic

human need (Simmel, Landmann, & Susman, 1957), a fundamental, inalienable right (Birkinshaw, 2006), and a constitutional protection (Warren & Brandeis, 1890). But it can offer instrumental value as well (Heald, 2006): privacy can make us productive by breaking the causal link between 'looking weird' and attracting attention, at least for defined spaces, times, or interactions in which attention is counterproductive.

Privacy's antipode, transparency, unsurprisingly has the opposite effect: the more transparent an environment, the more easily 'looking weird' draws attention from more people. This simple result has been sufficient to generate extraordinary interest in increasing organizational transparency over the past twenty years (Ball, Haggerty, & Lyon, 2012; Hood & Heald, 2006). Transparency has become management gospel. Even twenty years ago there was a "longstanding bias toward emphasizing the affiliative side of interpersonal communication… with far less attention focused on how people close themselves off to others and regulate their degree of accessibility, either individually or as members of dyads or other social units" (Burgoon et al., 1989: 131–132). Today, the push for transparency is everywhere, so much so that former Sun Microsystems Chairman (then CEO) Scott McNealy's famous sound bite says it all: "You have zero privacy anyway. Get over it" (Sprenger, 1999). The same year, in 1999, *two* books were published with the same title: "The End of Privacy" (Sykes, 1999; Whitaker, 1999). If that were true in 1999, it is even truer today: with ever greater sources of transparent real-time information, big data is everywhere, and people are sleeping with their smartphones to stay connected to it (Perlow, 2012).

Despite the fact that privacy and transparency are opposites and reflect an explicit tradeoff, the two concepts have evolved in separate fields, resulting in isolated bodies of knowledge without the benefit of integration, resolution, and sufficient prominence (Lyon, Haggerty, & Ball,

2012). This remains a source of considerable theoretical confusion for theory and practice. The confusion is amplified by the tendency to conflate rights-based and performance-based justifications for both privacy and transparency.[3] As a result, the literatures talk past each other: simply put, "the field is diffuse, scholars lack agreement on many important issues and knowledge is not very cumulative" (Marx, 2012: 49).

Ironically, reviews of theory on transparency and privacy, separately, draw on many of the same *component* parts. There are many similarities among the inputs, despite diametrically opposed conclusions. For example, Hood (2006) states in his review of transparency that he "brings together scholars and practitioners from economics, law, accounting, politics and government, public management, and information technology studies," while Solove (2008) draws on "jurists, legal scholars, philosophers, psychologists, and sociologists" for his most recent review of privacy. And yet, despite drawing on similar domains, the research has been "multi-disciplinary" rather than interdisciplinary (Marx, 2012), so equal support is found for opposing perspectives. The same inputs add up to perfectly contradictory outputs.

In the spirit of the plea by Weick (1999) for academic dialogues that reconcile in place of monologues that overwhelm ('paradigm wars'), my goal here is to encourage dialogue across the transparency and privacy literatures, not pit them against each other. The challenge of integrating the two concepts is heightened by the fact that both are "umbrella concepts" (Hirsch & Levin, 1999) under which various phenomena, in the domains mentioned above, have gathered. While

[3] For example, in the opening paragraph of their article, Sewell & Barker (2006) state: "intensive surveillance might *protect* us from the disruptive, illegal, or deviant acts of others, but, if taken to extremes, such surveillance also challenges what we consider (in liberal democracies, at least) to be basic civil *rights*, such as our right to privacy and our expectations of self-determination" (emphasis added). The implicit assumption is that performance (protection) stands in opposition to rights.

previous reviews have integrated across the *components* of transparency or privacy, none has done so with the umbrella concepts of transparency and privacy themselves. To bridge the two literatures, as is characteristic of research in organizational behavior, I use performance as the integrating variable.

How much transparency is good for performance? Or the other side of the same coin: where, how, and when should management provide zones of privacy to maximize organizational, team, or network performance? This performance-related query is rarely made in either of our current paradigms—in management theory, where transparency is dominant, or in philosophy and law, where privacy trumps. In the rare cases when such queries are made, discourse is typically plagued by a Halo Effect (Rosenzweig, 2007): when we discover bad acts too late, a claim for more transparency is made, typically by the aggrieved party; when competitive advantage or experimental opportunities for improvement are eroded by premature disclosure, privacy looks attractive. While there is no shortage of passion on the two sides, there is also shockingly little resolution for management theory or practice. Sufficiently detailed categorization to support robust descriptive theory (Christensen & Carlile, 2009) has yet to emerge.

The chapter will proceed as follows. First, a brief history of the quarter-century evolution from "transparent" to "transparency" is presented. Lest one thinks that progression simply substitutes a noun for a verb, the rise in use of the word "transparency" instead is demonstrated to signal a viral expansion in breadth of usage of the word. The definition of the word itself has changed, and so has its importance to management theory and practice. Second, a similar evolution from "private" to "privacy" is presented, although instead of a half-century trend, that instead reflects a four-hundred-year progression through philosophical and legal thought. Throughout the history, this chapter attempts to illuminate both the similarities and the tensions

between the two literatures, such that we (1) understand why the PrecisionMobile workers might have seen privacy as enabling performance; and (2) lay the foundations for a contingent, behavioral theory of transparency and privacy, elaborated upon in Chapter 5 which can begin to resolve the seemingly contradictory literatures. In doing so, theory comes one step closer to a rigorous understanding of whether, and under what circumstances, privacy may make us productive.

FROM TRANSPARENT TO TRANSPARENCY

Transparency is simultaneously an old and a new concept. For at least six centuries, starting as far back as the 1400s, the word "transparency" was narrowly defined as observability or "perviousness to light; diaphaneity; pellucidity" (Oxford english dictionary, 2013)—what we continue to commonly refer to as "transparent." The word "transparency" comes from the Latin word "transparere," a combination of trans ("through") and parere ("come in sight, appear") (www.etymonline.com). In the last twenty five years, however, there has been a significant shift in the definition of the word, with "transparency" taking on a broader meaning to include "openness," "freedom of information," and even "truth" (Collins, 2008; Hood, 2006), although that transformation appears to have taken place in popular usage without any official or critical debate (Heald, 2006: 4). Inherent in that re-conception of the word is that "transparency" demands more than mere observability; it offers the promise of *accurate* observability. Whether the change was official or viral, that evolution makes some sense when situated within management research and practice: to enable both learning and control, activity must be observed accurately, not just observed.

That definitional expansion has enabled a renaissance in the word's appeal and fame. If prevalence is an indication, then transparency indeed has become one of the great themes in

management theory today. In usage, the word's ubiquity has spiked: it was #10 of the 2009 top ten words of the year based on statistical analysis of usage in global print and electronic media (GlobalLanguageMonitor.com, 2009); it appeared in over 27,000 academic articles between 2000-2009, 15% of which were related to management, which was an increase of over 6x from the previous decade (ABI/Inform, EBSCOHost, ISI Web of Knowledge); in books, after having a rather steady presence for almost a century, usage of the word increased 4x in books tracked by Google (Google Books Ngram Viewer, Figure 3A); and recognizing the trend, Webster's New World College Dictionary named it "Word of the Year" in 2003 (Browning, 2003; "Websters New World College Dictionary word of the year," 2003), defining it tongue-and-cheek as "a policy with a positive spin, promising uncensored

Figure 3A: Transparency Appearances in Text

Source: Google Books Ngram Viewer (http://books.google.com/ngrams/)

exposure of records, moral conduct, and virtue" ("Websters New World College Dictionary word of the year," 2003). At the same time, transparency has become "unambiguously a Good Thing, and upheld as one of society's virtues… it's become conventional wisdom to seek greater transparency" (Collins, 2008). The last decade in particular has been marked by a "dogma of transparency" (Collins, 2008), a "cult of transparency" (Best, 2005; Böhm, 2005), and a transparency movement with "quasi-religious character" (Hood & Heald, 2006). Transparency is "en vogue" (Keegan, 2003). In his review of fiscal transparency in the UK government, Heald (2003: 739) concludes:

> It is difficult to voice opposition to transparency, just as it is to set oneself against accountability; this is the arena of persuasive language: One of the reasons why 'transparency' so often appears in arguments about better government is that the word combines the rhetorical advantages of ambiguity and positive associations (for who, apart from those with guilty secrets to hide or dubious interests to protect, could possibly be against 'transparency'?).

Transparency even has a democratic ring to it. It is "deemed inappropriate, if not undemocratic, to argue for the opposite" of transparency (Welch & Rotberg, 2006). As one transparency "guru" stated, "transparency is very much related to freedom, the quality of our relationships, the quality of our lives and the sustainability of our society" (Lazarus & McManus, 2006: 925). Oxford Professor of Government Christopher Hood (2006: 3), in his chapter providing a historical perspective on transparency, concludes:

> [The word transparency] is nowadays pervasive in the jargon of business governance as well as that of governments and international bodies, and has been used almost to saturation point in all of those domains over the past decade (Hood, 2001: 700–704). We might almost say that 'more-transparent-than-thou' has become the secular equivalent of 'holier than thou' in modern debates over matters of organization and governance…. Like many notions of a quasi-religious nature, transparency is more often preached than practiced, more often invoked than defined, and indeed might ironically be said to be mystic in essence, at least to some extent.

Part of that mysticism is due to remaining lack of clarity around the exact meaning of the word, which continues to allow it to indicate different things to different people. As Hood (2006: 18–19) concludes in his historical review of the word,

> as with the fissiparous doctrines and ideas that emerged within Protestantism after the Reformation in Europe, transparency is an idea that embraces many different strains. But those different doctrines tend to live in different literatures and policy domains, and it is at least debatable how far those different strains add up to a single 'big idea'. At some level they all translate into some view of openness about rules and behavior, but those to whom they apply—citizens, governments, organizations—are different, and the underlying doctrines of governance that they reflect may be conflicting…. [But] thinking about the governance of private corporations cannot be isolated from thinking about

> governance of public corporations, and the peak of modern 'transparency talk' in both of these spheres seems to have been reached at the same time in the 1990s.

It is, therefore, informative to see how definitions have emerged in various disciplines. In public administration, the Asian Development Bank defines it as "the availability of information to the general public and clarity about government rules, regulations and decisions" ("Asian Development Bank overview," ADB website), while the Oxford Dictionary of Economics defines "transparent policy measures" as "making it clear who is taking the decisions, what the measures are, who is gaining from them, and who is paying for them" (Black, 2003). It adds, "economists believe that policies are more likely to be rational if they are transparent than if they are opaque" (Black, 2003). In sociology and organization studies, transparency has been tied to surveillance, or "the few watching the many" (Sewell & Barker, 2006: 935, 937): "surveillance refers to management's ability to monitor, record and track employee performance, behaviours and personal characteristics in real time (for example, Internet or telephone monitoring) or as part of broader organizational processes (for example, drug testing in recruitment)" (Ball, 2010: 88). Surveillance has come to include not just visual surveillance (i.e., "big brother is watching"), but also "capture" surveillance, in which human activities are systematically reorganized to allow computers to track them in real time (Agre, 1994). Surveillance, and transparency, is both the act of active observation (e.g., security camera footage at a reception desk) and the act of setting up a system to passively notify the observer when an alarm is triggered (e.g., a motion sensor).

Transparency also has a stake in the growing sociological, social psychology, and psychology literatures on monitoring, from social facilitation (Zajonc, 1965) to peer monitoring (Loughry & Tosi, 2008) and supervision (Larson & Callahan, 1990; Stanton & Barnes-Farrell, 1996). In accounting and public administration, disclosure, or the obligation of firms or agents to

disclose circumstances for the benefit of their stakeholders or principles (Hood, 2006: 17), is yet another construct which directly implicates transparency. In popular use, transparency clearly has many powerful synonyms—among them surveillance, monitoring, disclosure—each with its own significant area of study.

In his review of the history of transparency, Hood (2006) organizes definitions of transparency in public administration literatures into three categories, each with its own shortcomings in execution:

Definition	Executional Shortcoming
1. Rule-Governed Administration: "the doctrine that government should operate according to fixed and predictable rules" (Hood, 2006: 5)	1. "Rulers and overseers of all kinds tend to demand open and rule-governed processes from those they oversee, while often claiming a cloak of privacy or confidentiality for the way they work themselves." (Hood, 2006: 6)
2. Candid and Open Social Communication: "social affairs more generally should be conducted with a high degree of frankness, openness, and candour" (Hood, 2006: 6)	2. "Books and auditing of accounts, instead of exposing frauds, only conceal them; for prudence is never so ready to conceive new precautions as knavery is to elude them." (Rousseau [1762] 1993: 154, quoted in Hood 2006:7)
3. "Making Organization and Society 'Knowable': "Social world should be made knowable by methods analogous to those used in the natural sciences." (Hood, 2006: 8)	3. "Jealousy is the life and soul of government. Transparency of management is certainly an immense security; but even transparency is of no avail without eyes to look at it." (Bentham [1802] 1931: 381, quoted in Hood 2006:10)

Although other conceptualizations of transparency exist, Hood and Heald's (2006) review summarizes the state-of-the-art by highlighting three common themes of the transparency dialogue.

- First, the word draws from old and deep traditions in political and philosophical thought, from Adam Smith (taxes "ought to be certain and not arbitrary"; Wealth of Nations, 1776: Book 5, Chapter 2) to Rousseau ("the eyes of the public" or "les yeux du public"; 1772) to Foucault ("other things equal, that sort of man whose conduct is likely to be most narrowly watched, is therefore the properest man to choose") (Bentham, 1791: 381; Rousseau, 1772; Smith, 1776). Jeremy Bentham (1790s) summarized it best in a single statement: "I do really take it for an indisputable truth, and a truth that is one of the corner-stones of political science—the more strictly we are watched, the better we behave" (Bentham, 2001: 277).
- Second, as the term has evolved in meaning, so too has the justification for transparency. Over time, many have argued for transparency as a basic "human right" (Birkinshaw, 2006) and therefore not judged according to its consequences, as illustrated by the number of normative words (e.g., "should," "ought," etc.) in the descriptions and justifications for transparency above. Nonetheless, in the evolution from "transparent" to "transparency" over the past two decades, much of the rhetoric has been functional, built on claims of the instrumental rather than intrinsic value of transparency (Heald, 2006). The discourse is increasingly focused on performance.
- Third, degree of transparency matters. As Heald (2006: 59) explains, "in general terms, at very low levels of transparency, more transparency is likely to be beneficial. The trade-offs are most apparent when transparency is already high, in which

> circumstance the direction and variety, not just the amount, of the incremental transparency will strongly influence the relationship between benefits and costs."

The third point, in particular, has implications for work environments focused on performance, such as PrecisionMobile. Different levels of transparency may be justified, contingent on context and anticipated behavioral response of those under the spotlight. Put differently, at high levels of transparency, for example, privacy may indeed be incrementally productive, although that is ultimately an empirical question.

FROM PRIVATE TO PRIVACY

The word "privacy," just like the word "transparency," elucidates so many connotations that it is well-understood yet poorly defined, with an "embarrassment of meanings" (Solove, 2006: 477). Daniel Solove, in his 2002 journal review *Conceptualizing Privacy* and 2008 book *Understanding Privacy*, begins by condemning privacy as a "sweeping concept, encompassing (among other things) freedom of thought, control over one's body, solitude in one's home, control over information about oneself, freedom from surveillance, protection of one's reputation, and protection from searches and interrogations" (Solove, 2002, 2008). Solove is in good company: while unable to agree on a definition, sociologists, philosophers, economists, and legal theorists all seem to agree that the term has remained poorly defined. Over 40 years ago, Westin (1967: 7) lamented, "few values so fundamental to society as privacy have been left so undefined in social theory or have been the subject of such vague and confused writing by social scientists." Shortly thereafter, Arthur Miller argued privacy was "difficult to define because it is exasperatingly vague and evanescent," a phrase that has been referenced thousands of times since (Miller, 1971: 25). Numerous others have followed suit: in Tom Gerety's *Redefining Privacy*, he declares that privacy has "a protean capacity to be all things to all lawyers" (Gerety,

1977); Judith Jarvis Thomson, in *The Right to Privacy*, declares that "perhaps the most striking thing about the right to privacy is that nobody seems to have any very clear idea what it is" (Post, 2001; Thomson, 1975); in Robert Post's *Three Concepts of Privacy*, he worries that "privacy is a value so complex, so entangled in competing and contradictory dimensions, so engorged with various and distinct meanings, that I sometimes despair whether it can be usefully addressed at all" (Post, 2001: 2087). Privacy is a highly variable concept, one that is used to serve diverse social values and purposes (Rule, 2012). Practically, it refers to anything from "closing blinds, shredding documents, or purchasing anti-surveillance devices" to "learning how to 'hide in the light'" (Gilliom, 2001; Lyon et al., 2012: 4; Marx, 2003; Nippert-Eng, 2010; Whitson & Haggerty, 2008).

It would therefore seem understandable that organizational behavior theorists have avoided importing "privacy" into the management literature as a useful construct. Nonetheless, although difficult to define, privacy is highly meaningful, and thus current management scholars and practitioners may ignore it to their own peril. The word privacy is "used often and is extremely valuable to many people" (Foye, 2008: 1). In daily life within organizations, the all-too-common phrase "let me give you some privacy to get that done" is one of only a number of examples of the regular use of the term.

A Short History of Privacy[4]

The general concept of privacy has existed throughout civilization in diverse cultures, with early expressions of a right to privacy identified by anthropologists and legal theorists in Sumerian, Babylonian, Judeo-Christian, and Indian historical texts (Soma, Courson, & Cadkin,

[4] For full histories of privacy in the United States and Europe, see, for example, (Seipp, 1978); the five-volume A History of Private Life (Veyne, 1987); and the 1971 Yearbook of the American Society for Political and Legal Philosophy, Nomos XIII (Pennock & Chapman, 1971).

2009). Some have argued that a need for privacy goes back to our animal roots, as "virtually all animals seek periods of individual seclusion or small-group intimacy"(Westin, 1967: 8), with privacy as a necessary ingredient for intimacy (Gerstein, 1978). In human expression, the word privacy itself can be traced back to 1598 (Oxford english dictionary, 2013), when Shakespeare spread the term through several of his plays such as the Merry Wives of Windsor (Shakespeare, 1598: Act IV, Scene 5).

As a legal concept, it was recognized by courts as early as 1604 in Semayne's Case, when the Court stated "[t]hat the house of every one is to him as his… castle and fortress[.]"(Coke, 1604). Initially a narrow concept, privacy grew first to mean privacy from government intrusion. As stated by Sir William Blackstone in 1769:

> Eaves-droppers, or fuch as liften under walls or windows, or the eaves of a houfe, to hearken after difcourfe, and thereupon to frame flanderous and mfcheivous tales, are a common nufance and prefentable at the court-leet: or are indictable at the feffions, and punifhable by fine and finding funreties for the good behavior. (Blackstone, 1769)

Privileging privacy against government intrusion continued in the new world, where it took the form of the Fourth Amendment to the US Constitution, guaranteeing against "unreasonable searches and seizures" by the government.

The emergence of efforts to more broadly privilege privacy (legally and normatively) in British and American society traces its roots to the relationship between law and culture in the late nineteenth century Victorian Compromise, according to Lawrence Friedman in his 2007 book *Guarding Life's Dark Secrets* (Friedman, 2007). The Victorian Compromise consisted of two principal, if paradoxical, components. First, the law increasingly adopted rules upholding socially-accepted moral values and punishing "immorality," particularly for the upper classes. The doctrines of seduction and breach of promise (where women could seek retribution and

recover their lost social status by bringing criminal charges against men who reneged on their promises of marriage) protected the lady of the house in sexual matters; libel and slander protected an individual's reputation from publicized lies; and the introduction of obscenity law regulated public discourse. Second, however, while the law forbade and punished (criminally) these immoral acts, it also appears to have recognized that slippages from morality were inevitable. It was therefore designed to shield individuals, particularly upper-class men who were "pillars of society," from legal ramifications. The shielding mechanism was privacy law. For instance, Friedman argues that blackmail law should be viewed as protecting elite men from threats by lower-class blackmailers when these pillars of society strayed from the demands of Victorian morality. While some viewed this as hypocrisy, Friedman argues that society at the time saw this duality as necessary to protect a fragile society from being disrupted by damage to reputations of the elites, who were viewed as essential for the maintenance of social stability. Although elites were necessary for social stability, they could not be counted upon to avoid immoral conduct. Thus, the Victorian Compromise encouraged the creation not only of moral norms, upheld by the law, to govern society, but also "zones of privacy" within which elites could misbehave. Ironically, "zones of privacy" included both red-light districts and the home (Friedman, 2007; Richards, 2009).

As Friedman (2007: 65) writes:

> A visitor from another galaxy who could read the penal code of a typical American state in the middle of the nineteenth century would learn that people were not supposed to steal, murder, rape, or burn down buildings and that they were also not supposed to have sex outside of marriage.
>
> But if the visitor looked more carefully at the texts—and at the behavior of the legal system, at law in action, the visitor would get a somewhat different picture. Here the real goal of the living law was not zero tolerance at all but caution, moderation, and a screen

of privacy. The careful reader of text and behavior would notice that the norms in fact tolerated certain deviations within certain limits.

The law was like a man who uttered stern words with his fingers crossed behind his back. Following that inauspicious start, the "right to privacy" entered the American scholarly lexicon through a more distinguished pedigree: Warren and Brandeis' seminal 1890 Harvard Law Review article on "The Right to Privacy," which they defined simply and narrowly as the "right to be let alone" (Cooley, 1879; Warren & Brandeis, 1890: 193). Motivated by a fear that modern technology would enable "what is whispered in the closet [to] be proclaimed from the house-tops," (Warren & Brandeis, 1890: 195–196) described the need for a right to privacy as follows:

> Of the desirability -- indeed of the necessity -- of some such protection, there can, it is believed, be no doubt. The press is overstepping in every direction the obvious bounds of propriety and of decency. Gossip is no longer the resource of the idle and of the vicious, but has become a trade, which is pursued with industry as well as effrontery. To satisfy a prurient taste the details of sexual relations are spread broadcast in the columns of the daily papers. To occupy the indolent, column upon column is filled with idle gossip, which can only be procured by intrusion upon the domestic circle. The intensity and complexity of life, attendant upon advancing civilization, have rendered necessary some retreat from the world, and man, under the refining influence of culture, has become more sensitive to publicity, so that solitude and privacy have become more essential to the individual; but modern enterprise and invention have, through invasions upon his privacy, subjected him to mental pain and distress, far greater than could be inflicted by mere bodily injury. Nor is the harm wrought by such invasions confined to the suffering of those who may be the subjects of journalistic or other enterprise. In this, as in other branches of commerce, the supply creates the demand. Each crop of unseemly gossip, thus harvested, becomes the seed of more, and, in direct proportion to its circulation, results in the lowering of social standards and of morality. Even gossip apparently harmless, when widely and persistently circulated, is potent for evil. It both belittles and perverts. It belittles by inverting the relative importance of things, thus dwarfing the thoughts and aspirations of a people. When personal gossip attains the dignity of print, and crowds the space available for matters of real interest to the community, what wonder that the ignorant and thoughtless mistake its relative importance. Easy of comprehension, appealing to that weak side of human nature which is never wholly cast down by the misfortunes and frailties of our neighbors, no one can be surprised that it usurps the place of interest in brains capable of other things. Triviality destroys at once

> robustness of thought and delicacy of feeling. No enthusiasm can flourish, no generous impulse can survive under its blighting influence.

Warren and Brandeis made the above comments in the context of a rapidly urbanizing society where respite from the increasingly crowded cities was harder to find, the 'yellow press' was flourishing on the reporting of gossip and scandal, and most importantly, adoption of the portable camera was spreading quickly—and with it a tsunami-like proliferation of photographs taken outside of the controlled safety of photo studios. For neither the first nor the last time, privacy was under assault by technology. While vast amounts of land had made privacy a reality for the colonists, these technologies swung the pendulum in the opposite direction.

In their law review article, Warren and Brandeis quickly turn their attention from these motivations to the task of finding legal justifications for defending a right to privacy. The result is a law review article which many claim to be "the most influential law review article of all" time in any field (Keizer, 2012: 66) and privacy law experts view as having both established at least four common law privacy tort actions (intrusion upon seclusion, public disclosure of private facts, false light or publicity, and appropriation) in addition to spawning the law of privacy itself (Kalven Jr., 1966; Prosser, 1960; Solove, 2002). And while their law review article focused on establishing a right to privacy under tort law, after Brandeis joined the Supreme Court, his dissenting opinion in *Olmstead v. United States* laid the groundwork for a constitutional argument for privacy, although it would not be recognized by the majority until the mid-1960s in *Griswold v. Connecticut*. A majority of state constitutions now also recognize an explicit right to privacy (Soma et al., 2009).

Development of Definitions of Privacy in the Legal Sphere (and Beyond)

Much of the scholarly work on privacy published in the 120 years since Warren & Brandeis' law review article has focused on the legal justifications for expanding or narrowing the legal right to privacy, so a brief summary of the legal perspective is useful here. While the text of the U.S. Constitution does not explicitly establish an individual right to privacy, case law thereby has come to acknowledge "specific guarantees" of a zone of privacy within the Bill of Rights, specifically the First Amendment (guaranteeing the right to free speech, freedom of religion, and the right to association—in private, and therefore in public), Fourth Amendment (protecting against unlawful search and seizure in private places), Fifth Amendment (guaranteeing freedom from self-incrimination using private knowledge), and Ninth Amendment (addressing general liberties beyond those explicitly mentioned in the Bill of Rights).

As a result of the multitude of applications for privacy in the law, legal scholarship has defined privacy in an equally multifaceted way, along similar divisions. Solove distills definitions into six general headings which "capture the recurrent ideas" in the legal discourse (Solove, 2002):

(1) "the right to be let alone—Samuel Warren and Louis Brandeis' famous formulation for the right to privacy" (e.g., Warren & Brandeis, 1890, *Katz vs. United States*) ;
(2) "limited access to the self—the ability to shield oneself from unwanted access by others" (e.g., Halliburton, 2009);
(3) "secrecy—the concealment of certain matters from others" (e.g., Schwartz, 2009, *Whalen v. Roe*);
(4) "control over personal information—the ability to exercise control over information about oneself" (e.g., Magid, Tatikonda, & Cochran, 2009);
(5) "personhood—the protection of one's personality, individuality, and dignity" (e.g., Crocker, 2009, *Boy Scouts of America v. Dale*);
(6) "intimacy—control over, or limited access to, one's intimate relationships or aspects of life" (e.g., Suk, 2009);

Solove notes that these categories are not mutually exclusive, but instead overlapping (Solove, 2002). Rather than a taxonomy, they track the approaches through which legal scholars "have chosen to theorize about privacy" (Solove, 2002: 1092). Part of the reason for this haphazard categorization is the need in legal discourse to substantiate, based on legal precedent, the existence of a right to privacy in previous court decisions and constitutional interpretations. Each of the above six categories references a different, often mutually-exclusive stream of previous legal decisions. While a comprehensive treatment of those decisions is out of scope for this paper (see references above for background), the key point here is that legal precedent, rather than value-based evaluations, have driven the formulation of previous definitions of privacy. Definitions have been created to justify the right to privacy, rather than estimate the value of privacy. Even Warren and Brandeis, after concisely stating that "triviality destroys at once robustness of thought and delicacy of feeling," turn quickly to legal justifications for a 'right' to privacy (Warren & Brandeis, 1890: 196). And yet, just as the question of whether the net performance effect of transparency is positive or negative under certain circumstances is "an empirical question" (Heald, 2003: 750), the same is true of privacy.

Solove, to his credit, identifies this weakness and suggests a value-based approach, where "privacy has an instrumental value—namely, that it is valued as a means for achieving certain other ends that are valuable," (Solove, 2002: 30), just as Heald (2006: 59) suggests for transparency. Among the many possible candidates for the value of privacy, Solove (2002: 30) lists fostering "self-creation, independence, autonomy, creativity, imagination, counter-culture, freedom of thought, and reputation." For privacy law, Solove (2002: 22) uses that frame to motivate a conceptualization of privacy problems as "disruptions to certain practices," where "practices" broadly refer to "activities, norms, customs, and traditions." Privacy invasions

> disrupt and sometimes completely annihilate certain practices. Practices can be disrupted in certain ways, such as interference with peace of mind and tranquility, invasion of solitude, breach of confidentiality, loss of control over facts about oneself, searches of one's person or property, threats to or violations of personal security, destruction of reputation, surveillance, and so on" (Solove, 2002: 22).

Solove's core argument for legal jurisprudence is that there are certain similarities in (1) particular types of disruptions (see typology of privacy invasions by Kasper (2005: 76)) and (2) the practices they disrupt, and that privacy law would be more coherent, evolve more predictably, and avoid obsolescence more rapidly if it were built upon those similarities rather than the legal precedent-based categorizations used to date (Solove, 2002). In doing so, he argues that a conceptualization of privacy—and therefore privacy law—should be both contextual and pragmatic.

But Solove's arguments, in concert with similar themes tracing back to the original Warren & Brandeis (1890: 196) declaration that "triviality destroys at once robustness of thought and delicacy of feeling," hold significant meaning for organizations as well. Recall that Solove concludes that privacy fosters "self-creation, independence, autonomy, creativity, imagination, counter-culture, freedom of thought…" (Solove, 2002: 1145–1146). In effect, as suggested at the beginning of this chapter, privacy can allow for the conditions under which individuals feel comfortable 'looking weird'.

The Sociology and Social Psychology of Privacy

Sociologists and psychologists have previously initiated, although indirectly, a similar link. Barry Schwartz (1968: 741), in his article entitled "The Social Psychology of Privacy," begins with the premise:

> Patterns of interaction in any social system are accompanied by counter-patterns of withdrawal, one highly institutionalized (but unexplored) mode of which is privacy.

For that premise, Schwartz draws on Georg Simmel's essay "Brücke und Tür", where Simmel similarly writes: "Usually we only perceive as bound that which we have first isolated in some way. If things are to be joined they must first be separated. Practically as well as logically it would be nonsense to speak of binding that which is not separate in its own sense… Directly as well as symbolically, bodily as well as spiritually, we are continually separating our bonds and binding our separations" (Simmel et al., 1957: 1). In that sense, there is a strong similarity to the Durkheimian dialectic of social health: integration, or the strength of attachment people feel to society, and regulation, or the degree of external constraint imposed on people (Durkheim, 1912). As part of grid-group theory, Mary Douglas combined those dimensions into a 2x2, which interestingly Hood (2010) uses in a recent article to theorize on the connection between transparency and accountability. Schwartz (1968) is consistent with the Durkheimian view of social health through dialectical balance, only he shifts the focus to the tension between privacy and transparency (see also Altman, Vinsel, & Brown, 1981). For Schwartz (1968: 742), guarantees of privacy are "rules as to who may and who may not observe or reveal information about whom," which if accepted by all members of a social entity constitute a "common bond providing for periodic suspensions of interaction," an integration with society. When such structural provisions for privacy are not enforced, Schwartz anticipates the result to be illegitimate hiding—quoting Simmel (1964: 364), "where privacy is prohibited, man can only imagine separateness as an act of stealth."

Within that framework, Schwartz (1968: 744) assigns three sociological functions to privacy: (1) as a legitimate justification for withdrawal from peer interactions, privacy preserves horizontal, peer interactions over the long-term by providing brief releases from them when they become "sufficiently intense to be irritating"; (2) as a scarce resource, possession of privacy

"reflects and clarifies status divisions, thus dramatizing (and thereby stabilizing) the vertical order"; and (3) as a means of permitting individual expressions of deviance, which might otherwise destabilize the social order of the collective, through "invisible transgressions" which therefore serve to "maintain intact those rules which would be subverted by the public disobedience that might occur in its absence." It is this third function which is most interesting here, as 'invisible transgressions' could very well represent a means for encouraging explorative activities in an exploitative context.

Until the mid-1970s, this line of research on privacy was quite robust, reflected in key sociological publications by authors including Georg Simmel, George Orwell (e.g., "1984" by Orwell, 1949), Erving Goffman (e.g., "front and back region differentiation," Goffman, 1959: 123), Robert Merton (e.g., "some measure of leeway in conforming to role expectations is presupposed in all groups," Merton, 1957: 343), Wilbur Moore & Melvin Tumin (e.g., "all social groups… require some quotient of ignorance to preserve espirit de corps," Moore & Tumin, 1949: 792), and Barney Glaser & Anselm Strauss (e.g., social interaction is defined in terms of "what each interactant in a situation knows about the identity of the other and his own identity in the eyes of the other," Glaser & Strauss, 1964: 670), all of whom Schwartz (1968) draws upon. Extending the work of these sociologists, in 1971, the entire Yearbook of the American Society for Political and Legal Philosophy (Nomos XIII) was dedicated to furthering privacy theory and developing the privacy construct (Pennock & Chapman, 1971).

As a capstone to the work on privacy done in the 1960s and early 1970s, Irwin Altman published "The Environment and Social Behavior," in which he dealt at length with privacy as an "interpersonal boundary-control process, which paces and regulates interaction with others" (Altman, 1975: 10). He continues, "privacy regulation by persons and groups is somewhat like the shifting permeability of a cell membrane. Sometimes the person or group is receptive to outside inputs, and sometimes the person or group closes off contact with the outside environment" (Altman, 1975: 11). For Altman, privacy was an optimizing process, as depicted by the zone of "satisfactory match of desired and achieved privacy" in Figure 3B (Figure 2-3 in Altman, 1975: 26). Based on an environmentally contingent need (Lawrence & Lorsch, 1967), individuals regulate access to the self or groups, optimizing between no access, full access, and somewhere in-between, like goldilocks and the three bowls of porridge.

Figure 3B: Privacy as an Optimization Process (Altman)

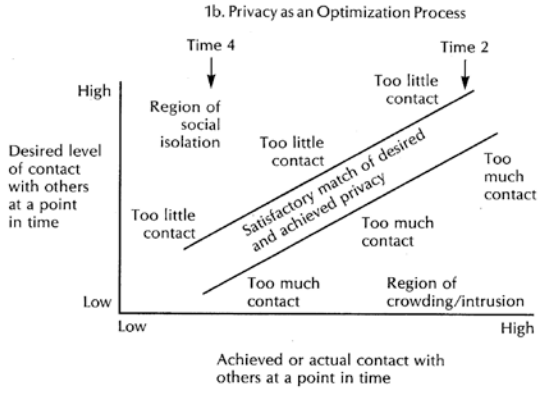


Figure 2–3. Dialectic and Optimization Properties of Privacy.

Source: Altman, 1975:26

Following the earlier conclusion by Westin (1967: 13) that "anthropological studies have shown that the individual in virtually every society engages in a continuing personal process by which he seeks privacy at some times and disclosure or companionship at others," Altman (1975: 12–13) finds privacy regulation to be a "cultural universal":

> Most societies have evolved means for allowing persons and groups to regulate social interaction. While the mechanisms may differ across societies, there appears to be a "cultural universal" that people in groups can shut off and open themselves to contact with others at different times. A viable society probably cannot exist if many members are totally and permanently out of contact with others. But it is also probable that few societies exist where people have no barriers against others. What appears to be different

> among societies is not the absence of interpersonal-boundary processes but the specific behavioral mechanisms by which some degree of control is achieved.

Altman supports the "cultural universal" through multiple archival case studies: the Taureg Culture of Northern Africa, in which male members wear a veil as an important source of privacy by masking facial expressions, identity, and specifically the mouth , and the veil is constantly adjusted to the social situation—to reflect status and approachability (Murphy, 1964; Westin, 1967); the Mehinacu Culture of Brazil, where villages are designed such that everything can be seen and heard by all, and yet they suppress emotional expression, speak softly, maintain a maze of hidden paths to secret clearings in the forest where hiding is possible, and men engage in various rituals which, over a lifetime, can result in about cumulative eight years of isolation (Roberts & Gregor, 1971); the Java society in Indonesia, where there are no physical boundaries but "shut people out with a wall of etiquette…, with emotional restraint, and with a general lack of candor in both speech and behavior" (Westin, 1967:16-17, quoting Geertz, 1959); in contrast, the Bali society in Indonesia, where high walls around the home create a physical fortress removing the need for a psychological one, although "when one steps through the doorway to the street, … he becomes more or less like the Javanese" (Westin, 1967:17; Altman, 1975:16); the high walls, careful lot location to avoid visual access by outsiders, and shifting room and wall arrangements to achieve situational privacy characteristic of the Japanese home (Canter & Canter, 1971); behavioral techniques used by residents of an Israeli kibbutz to separate themselves from others (Davis & Olesen, 1971); vine-hung gardens in ancient Egypt, porticoes in Greece, various enclosures in Rome, and country homes guarded by stone walls and parks in Britain (Altman, 1975); and even scientifically-grounded connections between the privacy of animal nests and the therapeutic needs of mental-health patients (Osmond, 1957). In perhaps the best summary of this point, Altman (1975: 16) quotes from Silber (1971: 228):

> The strip teaser would seem to forfeit, by virtue of her professional calling, the privacy of her body. She has, it might seem, no private parts, since she has contracted for their display. But in the blank, dead expression on the face of the dancer one sees the closed door, the wall, behind which she hides an intense, if limited, privacy. She wears her fig leaf on her face. With eyes that disclose nothing—least of all an interest in what she is doing or in those who are watching her—she preserves some part of her individuality from public gaze. Some dancers exhibit such powers of withdrawal that they succeed in totally estranging themselves from the audience. Because she does not value the intimate disclosure of her body, because she makes her body available with such utter indifference, that rare dancer may even convey to a stupid and drunken audience the stark realization that in seeing all they have seen nothing. What is offered publicly to an audience becomes private once again.

While there may seem to be a great divide between strip tease and organizational behavior, recent book titles including "The Naked Employee" (Lane, 2003), "The Naked Organization" (Tapscott & Ticoll, 2003), and "The Naked Leader" (Taylor, 2002) suggest the analogy may be quite apt. Indeed, there is even a company called "Naked Generations" which provides consulting services on how to market to, and socially influence, Generation Y.

To summarize the work on privacy by social psychologists, three conclusions that build on each other are particularly relevant.

1. First, a need for privacy is universal to all cultures. While Altman focuses on social cultures, the same is likely true of organizational cultures. For even the most transparent organizations, the question is not how much privacy employees have, but how they achieve it.
2. Second, as the above would suggest, privacy boundaries can take many forms, from physical to behavioral.
3. Third, those forms of privacy tend to operate as substitutes: where physical privacy is reduced, privacy is achieved through other less obvious behaviors, such that an individual or group reaches the 'optimized' level of privacy for a given context.

In Altman's (1975:42) own words:

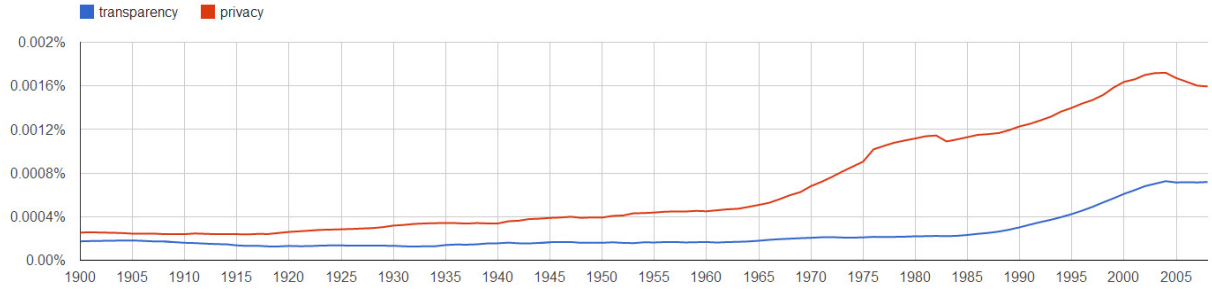
> Is it proper to say that some societies are highly private and others are nonprivate? According to Westin's (1967) research and to my approach, the answer is probably "no." Rather, if one examines carefully a culture with seemingly little privacy, privacy

> mechanisms will eventually be uncovered. Such mechanisms may be nonverbal or verbal, or they may be a blend of these with environmental techniques. Thus I believe that they exist in some form in *all* cultures. To put the point more dramatically, it might be said that mechanisms for separating the self and the non-self—that is, for regulating interpersonal boundaries to achieve a desired level of privacy—are universal and present in all societies. Some cultures may appear to have little privacy, but this is probably due to a traditional view of privacy as solely a physical-environmental process and not a complex behavioral system that draws on many levels of functioning.

Unfortunately, since the late-1970s, work on privacy splintered into siloes of applied science, with investigations conducted by individuals who are singular in their interest and expertise (Waldo, Lin, & Millett, 2007). Scholars of information technology have focused on the impact of new technology on individual privacy, while lawyers (in both academic institutions and advocacy groups) have attempted to address how the law should respond to protect individual rights. Business academics have increasingly addressed the use of personal information in business (typically for marketing or e-commerce), while communication scholars have worried about the implications of such rich files of consumer information (e.g., a book by Gandy (1993) on the political economy implications of the panoptic sort). Architects have tried to understand the relationship between visibility and privacy in open office space (Archea, 1977; Boje, 1971; Brennan, Chugh, & Kline, 2002; Reichel & John, 1977; Sundstrom, 1986; Sundstrom, Burt, & Kamp, 1980). Rich discussions of the value of boundaries in both the sociological and networks literatures (for reviews, see Lamont & Molnar (2002) ; Lazer & Friedman (2007), respectively), without specifically mentioning privacy, suggest that forming productive individual and group identity requires four components, the first of which is "a boundary separating me from you or us from them" (Tilly, 2003). The few economists who have examined privacy have done so from the standpoint of marketable rights in privacy and/or asymmetric information due to privacy (Waldo et al., 2007). While the word privacy has increased in prominence in print, in tandem

with transparency but with even more magnitude (Google Ngram Viewer, Figure 3C), its applicability has actually narrowed.

Figure 3C: Privacy and Transparency Appearances in Text



Source: Google Books Ngram Viewer (http://books.google.com/ngrams/)

Few have looked at organizational performance implications, in part because the management sciences have, for the most part, ignored privacy as a phenomenon of interest in recent times. Perhaps the closest theory has come is the literature on social facilitation. Building on early work by Allport (1924) and Zajonc (1965, 1968), laboratory research by social psychologists in the 1970s and 1980s demonstrated, in greater and greater detail, that people perform simple or well-learned tasks (e.g., simple clerical chores) faster and/or more accurately in the presence of others than when alone, but perform worse on a highly complex tasks (e.g., Aiello & Kolb, 1995). Similarly, in her dissertation research, Monica Higgins (1995) found that learning is best done without an observer's gaze, but performance could be enhanced under certain circumstances, and at certain times, with observation and/or evaluation (Higgins, 1995; 2001). This stream of work has sparked great interest in the connection between arousal and performance, but the concept of privacy seems to have faded without much notice.

Nonetheless, in an era of transparency, the above findings about privacy in society have obvious and profound implications for organizations as well. That may be even truer as

organizations face an environment marked by increasingly rapid change. Altman (1975: 45) concluded that "the privacy-regulation system is a dynamic one," with mechanisms "shifting over time with changing circumstances." As organizations change, so may mechanisms for privacy, with potential performance implications. Understanding how privacy operates in organizations to influence performance, and how to use it as a lever for higher performance, would appear to have the potential for substantial managerial impact.

Privacy in Organizations: Legal Perspectives

While the powerful literature on privacy summarized above has defined privacy as a multi-level phenomenon, nearly all of the empirical work to date has been focused on the individual level—privacy is analyzed as the "indistinct and, at times, dimly perceived boundary between the individual and the community collective, or redraws the line separating the person and the personal from the public" (Halliburton, 2009: 808). Among the four states of privacy identified by Westin (1967)—solitude, anonymity, reserve, and intimacy—only intimacy is a group-level phenomenon. Traditional treatments of "privacy" in organizations, nearly all of them legal in nature, have involved questions of individual employee monitoring and surveillance. Even in the case of intimacy, much of the focus has been on the need for privacy to support an individual's capacity to "respect, love, trust, feel affection for others, and to regard ourselves as the objects of love, trust and affection" (Fried, 1968: 477–478).

In part, legal scholarship on privacy has bypassed organization-level investigations for good reason: despite water cooler mythology to the contrary, many legal privacy protections are not applicable to the workplace unless the employer is the government. All of the Constitutional privacy protections require "state action" (Wiborn, 1998). In fact, and well within the bounds of the law, most employers regularly monitor employee behavior in the workplace using various

forms of technology (Levinson, 2009). Even government employees have limited privacy protection, as stated by the U.S. Supreme Court in *O'Connor v. Ortega* (*O'Connor v. Ortega* 1987). Generally, courts have upheld and allowed an employer's surveillance of its employees (Finkin, 2003). Indeed, in part because private organizations can monitor employees without the constraints faced by government surveillance of citizenry, the government relies heavily on private organizations to gather and report information about their workers (Lane, 2003). For example, while the government could not require individuals to get a social security number, private organizations' use of it for everything from job applications to loan requests has made it a de facto identification number leveraged heavily in surveillance activities (Kouri, 2005).

Some have tried to mount legal cases against surveillance, but to date, attempts to enact federal legislation protecting workplace privacy rights for employees have failed (Levinson, 2009; Smith-Butler, 2009), and protection via state constitutions, state legislation, or common law tort actions is limited (Finkin, 2003; Prosser, 1960; Smith-Butler, 2009). In practice, managers who set clear expectations through disclosure of the types of surveillance used can indeed legally monitor employees, at least to the limit of what is practical (Smith-Butler, 2009).

Employers monitor employee conduct in the workplace for a number of very good reasons. While the most traditional managerial rationale is to ensure that employees do not spend a significant portion of their working hours managing personal business or engaging in any activity which results in a loss of productivity to the firm, liability has become an even more important driver. Employee misuse of employer tools, especially tools for electronic communication, can subject the employer to liability on claims including defamation, libel, sexual harassment, discrimination, and breaches of confidentiality (Smith-Butler, 2009). Similar

concerns about liability, albeit of a different kind, have triggered increased monitoring in the public sphere since the watershed events of 9/11 (Blackwell, 2004).

In her recent review of privacy law in the workplace, Smith-Butler (2009) concludes that employers who adhere to legal best practices will provide clear communications about privacy expectations, resulting in improved employee morale and protection for employers. The leading advice to management is to be transparent about the level of surveillance, whatever it is, to set reasonable expectations of employees accordingly (Alder, Noel, & Ambrose, 2006; Mujtaba, 2003; Smith-Butler, 2009), although contradictory evidence exists as well (Stanton & Barnes-Farrell, 1996). Our recent Harvard Business School case shows what can happen when there are mismatched or unclear expectations (Shih, Bernstein, and Bilimoria, 2009). Yet exactly how these monitoring policies actually impact performance in the workplace remains an open question, as is equally evident from the preceding discussion on transparency.

INTERFACES BETWEEN TRANSPARENCY, PRIVACY, AND ORGANIZATIONAL BEHAVIOR

The practical limits of transparency have changed substantially with improvements in technology (for a review, see Kidwell & Sprague, 2009). At relatively low cost, it is now possible for managers, without any physical surveillance of cubicles or offices, to track Internet usage, sites visited, and software opened; monitor e-mail communications; log keystrokes, cookies, clicktrails, and potential improper distribution of proprietary intellectual property ("snitchware"); listen in on telephone conversations or meetings; screen caller IDs; conduct video surveillance, including the use of recognition technologies to determine gender, age, and even identity on low-resolution security monitor footage; monitor location through GPS (global positioning) software embedded in mobile devices or vehicles; track who is meeting with whom

based on mobile phone sensors; and sense-enhanced searches which look through clothes or skin to uncover hidden threats, anxiety, or even mood/emotion (Froomkin, 2000; Levinson, 2009; Smith-Butler, 2009). All of these methods, and more, are now in wide use (Ball et al., 2012; Court, 2004; Swaya & Eisenstein, 2005). Of 304 leading U.S. companies surveyed by the AMA/ePolicy Institute in 2007, 45% of companies tracked accessed internet content, keystrokes, and time at the keyboard, 43% monitored email (two-fifths of those employed individuals to manually read and review others' emails), 45% monitored phone records, 16% recorded phone conversations, and 7% used video surveillance to track on-the-job performance (AMA, 2007). The resulting surveillance data is voluminous, permanent, and impersonal (Jones, 2003). Almost a half century ago, Westin (1967: 22) foreshadowed that "technological change promises to give public and private authorities the physical power to do what a combination of physical and socio-legal restraints had denied to them as part of our basic social system," a prophecy which Lane (2003) argues has come true. Rosabeth Moss Kanter (2009) more recently observed, "technology has posed new challenges, as it always does, but many of them involve the Watchbirds who can watch us."

A few pivotal, though peripheral, areas of study in organizational behavior offer clues to the behavioral and performance implications of that trend. I focus here on four interrelated areas of research: trust, power, deliberation, and structural ambidexterity.

Trust

The importance of trust (De Jong & Elfring, 2010; Dirks & Ferrin, 2001; Kramer, 1999; McEvily, Perrone, & Zaheer, 2003; Pirson & Malhotra, 2011) for organizational performance is well-established. Trust, or a psychological state in which one accepts vulnerability or reliance towards another on the basis of confident, positive expectations about the other's future actions,

intentions, or behavior (Rousseau, Sitkin, Burt, & Camerer, 1998), improves organizational performance because members who trust each other can interact "as if their uncertainty and vulnerability were favorably resolved" (De Jong & Elfring, 2010: 536) and therefore are more likely to engage in productive interactions and processes (Jones & George, 1998; Mayer, Davis, & Schoorman, 1995; Spreitzer, Noble, Mishra, & Cooke, 1999). A review of 40 years of empirical studies supports that conclusion, although not without some inconsistencies, and also suggests that trust may offer indirect benefits by facilitating or amplifying other productive organizational activities and others' positive interpretations or assessments of them (Dirks & Ferrin, 2001).

Trust, however, has a complicated relationship with the balance between transparency and privacy. As observers, the more we see, the more easily we trust. As the observed, the more that is seen of us, the less we feel trusted. There is therefore a natural tension between "trust me" and "show me" depending on the role of the individual in question. For the party requesting trust, "show me" seems required only when "trust me" is insufficient; for the party being asked to trust, "show me" makes "trust me" more possible. Nonetheless, while "trust me" and "show me" therefore seem to be substitutes or even, at the most extreme, opposites, both are simultaneously celebrated in management theory as good practice: trust is an "important lubricant of a social system" (Arrow, quoted in Bradach & Eccles, 1989: 104), while transparency has become management gospel. Declining levels of either would appear to have significant and negative impacts on performance, and yet the interaction between them puts them into tension with one another.

For an example of that tension, consider the classic observation by Gouldner (1954: 161) at the gypsum plant:

> In other words, close supervision enmeshed management in a vicious cycle: the supervisor perceived the worker as unmotivated; he then carefully watched and directed him; this aroused the worker's ire and accentuated his apathy, and now the supervisor was back to where he began. Close supervision did not solve his problem. In fact, it might make the worker's performance, in the super's absence, even less reliable than it had been.

Gouldner similarly identified the notion that workers could 'strike' by following the 'rules' literally. Other scholars have noted similar downward spirals triggered by observers outside of the organization, as "oversight processes tend to encourage people to put their trust in third parties, with the effect of creating a spiral of mistrust between citizen and the professional" (Power, 1997). In the UK, the introduction of more severe transparency requirements appears to have "coincided with reducing rather than increasing levels of public trust in the very institutions and office-holders subjected to those requirements" (O'Neill, 2006: 76). Increased transparency led to decreased trust, which led to greater hiding behavior and less realized transparency. Conversely, Simon (1991) observed that what is surprising about organizations, in the absence of constant supervision, is not the level of opportunistic shirking but rather the level of voluntary effort.

Research on monitoring similarly suggests that transparency can undermine solidarity and create an atmosphere of mistrust (Langfred, 2004; Manning, 1997), inhibit the development of trust (Mayer et al., 1995), or even erode trust which existed previously (Strickland, 1958). On the one hand, the monitoring literature has framed transparency and trust as alternative, incompatible mechanisms of control (De Jong & Dirks, 2012; Luhmann, 1979; Piccoli & Ives, 2003). On the other hand, the presence of one without the other is rather hard to imagine (Webber, 2008). Like collaboration and control (Sundaramurthy & Lewis, 2003: 404, Figure 3), reinforcing cycles of transparency and trust would seem to mitigate the performance implications of only having one

or the other at the peer, team, and organizational levels (De Jong & Elfring, 2010; Loughry & Tosi, 2008). At the same time that one may yield positive motivational benefits from being trusted and not observed, one would also be protected against the negative motivational effects of feeling like others may be getting away with something without being monitored or disciplined. Reinforcing cycles of transparency and trust, properly designed, would appear to provide the elegant balance suggested by the popular dictum, "trust but verify."

Studies simultaneously demonstrate the value for the observer of transparent monitoring and the value for the observed of privacy boundaries. If we want to increase trust, we need to "avoid deception rather than secrecy" (O'Neill, 2002: 72). In some cases, increasing transparency may reduce deception and therefore increase trust; in other cases, privacy may do a better job of that.

Power

Tawney (1931: 229) described power as the "capacity of an individual, or group of individuals, to modify the conduct of other individuals or groups in the manner which he desires, and to prevent his own conduct being modified in the manner in which he does not." A burgeoning critical literature that is now known as surveillance studies (for a review, see Ball, 2010; 2012) is focused on how transparency affects that kind of power and resistance to power. In the tradition of Bentham (1787), Foucault (1977), Orwell (1949), Sewell (1998), and others, surveillance itself is defined as "regard or attendance to a person or to factors presumed to be associated with a person" (Ball et al., 2012: xxv), or simply "the few watching the many" (Sewell & Barker, 2006: 935). Substantial research has shown how increasing surveillance, in the workplace and beyond, is enabling the emergence of a surveillance society, compliance society, and/or audit society (Ball et al., 2012: xxv; Marx, 2005) with unmistakable power

implications. The potential for transparency to amplify, and potentially distort, the power relationships of an organization or even an entire society is becoming increasingly obvious. While dependency may define power (Emerson, 1962), the magnitude of its effect is dependent upon how transparent one's actions are to another. Some level of hiding permits a dependent a little space to breath. Stark transparency takes that away.

Consider, for example, work by Adler & Borys (1996) on enabling versus coercive bureaucracies. It could certainly be theorized that an environment that was starkly transparent would become de facto coercive because attention would always be on the nail that stood out. Indeed, they suggest that "the global transparency valued in a coercion logic is decidedly asymmetrical, as exemplified by Bentham's Panopticon" (Adler & Borys, 1996: 73), while Etzioni (2010: 9) concludes simply, "transparency is coercive." In Adler's earlier work at NUMMI, he distinguished "despotic" from "democratic" ways of implementing Taylorist principles of scientific job design via a technical dimension ("division of labor, standardization, formalization") and a social dimension ("the distribution of authority and power relations" (Adler, 1993: 5,83). When the despot is always watching, it is hard to imagine successful implementation of a democratic, learning-oriented version of Taylorism versus a "compliance bureaucracy" (Adler, 1993: 83) where "procedures are designed to highlight to superiors whether subordinates' actions are in compliance" (Adler & Borys, 1996: 71).

Even if the observer is not a despot, she may nonetheless appear that way in a starkly transparent environment. Gouldner (1954) comes to a similar conclusion: in his model, the amount of "close supervision" in an organization determined, in part, the form of bureaucracy which would emerge: representative bureaucracy (serving the interests of both managers and workers); punishment-centered bureaucracy (serving the interests of mangers over workers); or

mock bureaucracy (rules ignored by both parties). His observations of the gypsum plant suggested representative bureaucracy would be hard, if not impossible, to achieve in an environment with high levels of close supervision.

In the workplace more generally, research has demonstrated that individuals who start with less power in organizations experience relatively greater losses of power as surveillance increases: their fear of losing privileged rewards or access to resources as a result of appearing incompetent in front of those with more power erodes their bases of power substantially (Lee, 1997; Winter, 1973, 1993). Some have even drawn a connection to the conception of a "total institution" introduced by Goffman (1961: 17) in which everything is watched and controlled, thereby almost completely stripping those who are watched of power relative to those who do the watching. There should be little doubt that trends towards greater and greater transparency over the past several decades are changing power dynamics in substantial ways, especially now that the starting point already involves considerable levels of transparency in place today.

Analogously, in his book *Seeing Like a State*, James Scott (1999) provides examples, in tremendous detail, of how governments have, at various points in time and in various contexts, sought to make the communities under their authority more observable—through everything from governance to city design—to make the state more rational, controllable, and governable. In each of those cases, observability is equated to power of the governing body. Scott's conclusion, however, is that those efforts "to improve the human condition" have been counterproductive, because observers (in his examples, central governments) have failed to appreciate the important role of unobserved, local-level chaos and dissimilarity in ultimately producing the outcomes they seek (Scott, 1999: 4). The parallel to organizational life and performance is obvious in Scott's analysis. Across contexts, transparency has succeeded in

increasing the reach and immediacy of attention and power of the observer (Sewell, 1998: 413), even sometimes overextending the observer's influence over the observed (e.g., Ball, 2010), but it has not produced the sought-after result of improved performance of society (Scott, 1999). In part, that is because it has been known to produce behaviors it was designed to prevent, as the observed try to subvert and manipulate the boundaries of when, where, and how they are measured (Frenkel, Tam, Korczynski, & Shire, 1998; McCahill & Norris, 1999; Townsend, 2005), similar to the qualitative study results at PrecisionMobile.

Similarities can be drawn to prior work on power and territoriality (for reviews, see Brown, Lawrence, & Robinson, 2005; Edney & Buda, 1976; Altman, 1975: 103–145), defined as "behavioral expression… of feelings of ownership toward a physical or social object" which includes "behaviors for constructing, communicating, maintaining, and restoring territories" around those objects, whether tangible or intangible, toward which one feels "proprietary attachment" (Brown et al., 2005: 578). Territoriality can increase productivity and satisfaction by engendering feelings of belonging to social groups (Altman, 1975; Lewis, 1979) and reducing conflict through clarification of the boundaries of social interactions (Altman & Haythorn, 1967; Brown et al., 2005; Rosenblatt & Budd, 1975). But transparent design pierces territoriality markers in its attempt to improve knowledge transfer and operational control, putting both tangible and intangible territoriality at risk. By definition, increased operational control seeks access to tangible territory that would otherwise be protected, like an experimental workspace or a secure file cabinet, while increased knowledge transfer seeks access to intangible territory guarded to protect previously private ideas. A move towards transparent design, ceteris paribus, does make it far more difficult to create a place of one's own (Pierce, Kostova, & Dirks, 2003) in the organization. In their review of territoriality, Brown et al. (2005) ask how a move from

"private offices to primarily open offices with few partitions" might affect organizational performance, given likely defensive behavioral responses triggered by organizational intrusion on individuals' and groups' territory.

In contrast, a "healthy divide" within groups and organizations has been shown to contribute to learning and performance (Gibson & Vermeulen, 2003). More generally, boundaries providing freedom from the power bestowed by transparency, creating a state of privacy, have been found to enable the authenticity required for meaningful experimentation (Simmel, 1950), the generation of new ideas (Eysenck, 1995; Hargadon, 2003; Simonton, 2003; Sutton & Kelley, 1997), the maintenance of expertise attached to professional identity (Anteby, 2008), the capacity to trust others (Scheler, 1957), and the maintenance of long-term meaningful relationships and group associations (Ingham, 1978; Kanter & Khurana, 2009; Mill, 1859; Schwartz, 1968; Simmel, 1950), all behaviors associated with effective knowledge sharing (Edmondson, 2002) and "enabling" operational control (Adler & Borys, 1996; Hackman & Wageman, 1995). In this body of literature, boundaries providing some demarcation between "us" and "them" (Lamont & Molnar, 2002) are the solution for those who identify a panopticon-like awareness of being visible (Foucault, 1977: 201–203) to be the problem.

There is a consistent theme across very diverse conceptual landscapes: power of the observer expands with the size of the field of view. Sometimes, that additional transparency, and the power it provides, is productive. Every scandal, from Madoff to sex abuse in the Catholic church, reminds us that our field of view may be too narrow. But there are times when it may be too broad as well. At some point, and under certain circumstances, constraining that power with limits to transparency, even if they are temporary ones, can benefit the quality of outcomes produced. Privacy boundaries, and their constraint of power, can be productive.

Deliberation

Gouldner's conclusion that representative bureaucracy would be difficult under close supervision would not be surprising to other scholars who also study representation, albeit of a very different kind. Within the field of deliberative democracy (Habermas, 1991, 1992), scholars have also found that boundaries to transparency are necessary for effective deliberation. Indeed, some political scientists have recently taken a more critical view of transparency. While public debate is "conducive to reasoned argument and common good" (Bachtiger, Sporndli, Steenbergen, & Steiner, 2005), it is also "primarily a place for presenting positions and not a place for real dialogue (nor for bargaining)" (Bachtiger & Steiner, 2005: 158). In Goffmanesque vocabulary, "when playing for an audience of citizens, legislators in a competitive system know that there is much to gain by discrediting one's opponents and little to gain from praising them" (Steiner, Bächtiger, Spörndli, & Steenbergen, 2005: 130). In the glare of transparency, arguments may "become shallow, poorly reasoned, pandering, or appeal to the worst that we have in common. The question to be asked now is when does the desire to please an audience lead to 'well-crafted' arguments and when does it lead to 'rhetoric, demagoguery, and overbidding" (Chambers, 2005: 260).

Consistent with that question, new empirical research on deliberation in political science suggests that, under certain circumstances, "it is better for public deliberation to go behind closed doors and so insulate deliberators from the harmful effects of the glare of publicity" (Chambers, 2005: 255). Observing that normative deliberation theory stresses a productive view of publicity, while empirical research tends to support a negative view, Chambers (2005: 256) argues "they are both right." Transparency has its place but should neither be extreme nor universal.

To illustrate the negative effect that transparency can have on the quality of discourse, Jon Elster (1995, 1998) compares the Constitutional Convention of 1787 in Philadelphia, which deliberated in private, with the nearly contemporaneous Assemblée Constituante of 1789 in France, which deliberated in public. Elster (1995: 251) finds:

> Many of the debates at the Federal Convention were indeed of high quality: remarkably free from cant and remarkably grounded in rational argument. By contrast, the discussions of the Assemblée Constituante were heavily tainted with rhetoric, demagoguery, and overbidding.

Amy Gutmann and Dennis Thompson use the archival data on the Constitutional Convention to conclude that, in the privacy of the room, "members could speak candidly, change their positions, and accept compromises without constantly worrying about what the public and the press might say" (Gutmann & Thompson, 1996: 115). While generally arguing for transparency, they nonetheless argue that privacy is a "justifiable way of encouraging better discussion and fuller consideration of legislation" (Gutmann & Thompson, 1996: 116).

Structural Ambidexterity

The word ambidexterity, derived from the Latin word *ambidexter* (right-handed on both sides), was originally used to describe "one who takes bribes from both sides" before being used to describe individuals who could use both hands equally well beginning in the late 16th century (Online Etymology Dictionary). Beginning with Duncan's addition of the modifier "organizational" in 1976, the phrase organizational ambidexterity borrowed the heart of the meaning of *ambidexter* and applied it to organizations, first referring to organizations capable of simultaneously exploiting existing competencies and exploring new ones (Duncan, 1976; Tushman & O'Reilly, 1996) and then expanding into an umbrella construct for organizations capable of managing past a common set of seemingly irresolvable tradeoffs: in organizational

learning, exploration versus exploitation (March, 1991); in quality, control versus learning in Total Quality Management (Hackman & Wageman, 1995; Sitkin et al., 1994); in organizational leadership, "integrative thinking" with an "opposable mind," or the capacity to hold "two opposing ideas in mind at the same time and still retain the ability to function" (Fitzgerald, 1931; Martin, 2009).

Can organizations be ambidextrous? Despite tensions in organizational priorities which gently but consistently nudge organizations towards the variance-reducing side of the duality (Benner & Tushman, 2002; Levinthal & March, 1993; March, 1991), evidence from the past four decades strongly suggests organizations can achieve ambidexterity (see e.g., O'Reilly & Tushman, 2004; Raisch, Birkinshaw, Probst, & Tushman, 2009; Tushman & O'Reilly, 1996). Answers to the question of *how* organizations become ambidextrous have been more elusive, despite significant theoretical progress. In their recent, comprehensive review of the organizational ambidexterity literature, Raisch & Birkinshaw (2008) divide the range of antecedents into 3 categories: structural, contextual, and leadership. The heart of the structural question is one of boundaries: how are structures supporting exploration and exploitation activities bounded to protect against dominance of one over the other, while simultaneously continuing to permit sufficient organizational fluidity between them to permit integration. Duncan originally proposed creating separate units to pursue either exploration or exploitation (Duncan, 1976), with each organizational unit designed to meet the contingencies of its target environment (Lawrence & Lorsch, 1967). Units designed for exploitation would be designed in accordance with the architecture of large, mature organizations—decentralized, tightly coupled, with a focus on process management and incremental improvement for today. Units designed for exploration, on the other hand, would be designed more like entrepreneurial startups—small,

loosely coupled, and focused on product innovation and invention for tomorrow. With more conceptual development and field data, a key question emerged around how much "spatial separation," in the words of Raisch & Birkinshaw (2008), was required to protect the exploitation-focused units from crowding out the exploration-focused ones. From the historical review above, a consistently important form of "spatial separation" would seem to be privacy.

That connection between "spatial separation" and theory on privacy brings privacy in contact with a number of important findings in the management literature. The modular design of an organization, team, or even product has been found to determine not just which design rules, and which information, is visible to whom, but also the success and longevity of the overall system (Baldwin & Clark, 2000; Wheelwright & Clark, 1992). Autonomous business units have been suggested as part of the solution to the innovator's dilemma (Christensen & Raynor, 2003) *because* they are autonomous from the status quo business model and therefore not subject to the same resource-, process-, and priority-based oversight as the rest of the organization (Christensen & Kaufman, 2008). Boundaries (or spatial separation) provide an opportunity for learning to be "local and variegated" (Edmondson, 2002) by bounding and embedding knowledge within a function, unit, or team for at least some period of time (Carlile, 2002). For example, in their study of the Toyota Production System, Adler, Goldoftas, & Levine (1999: 43) conclude that "novel forms of organizational partitioning enabled differentiated subunits to work in parallel on routine and non-routine tasks." Such structural ambidexterity is, as the term suggests, enabled by structural boundaries (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2008) like those created through privacy boundaries, in-between cycles of external monitoring, search, integration, and/or exportation (Ancona & Bresman, 2007; Ancona, Bresman, & Caldwell, 2009; Ancona & Caldwell, 1992).

While arguments for the performance benefits of privacy bear some similarity to the above literatures on modular design, autonomous units, and ambidexterity, as well as general theory on autonomy (Hackman & Oldham, 1975), a key difference remains. Compared with the interventions proposed by those literatures, implementing privacy can be far less invasive. Boundaries to visibility are not only low cost, but also highly flexible over time and often permeable. If privacy indeed can have a similar impact on power dynamics, attention, and therefore organizational performance, but without the substantial organizational change efforts requirement for the other design interventions, then privacy may have an important role to play among this category of management tools.

CONCLUSION

In this chapter, transparency and privacy have been framed as two interrelated yet paradoxical (Lewis, 2000) levers that require balance. The time is ripe to be asking such questions about transparency, privacy, and performance, while taking into account both theories of transparency and privacy and also interrelated literatures on trust, power, deliberation, and ambidexterity. As detailed above, organizations are reaching a point where cheap surveillance technology is making it more costly to protect privacy than to eliminate it. Advances in digital communications (e.g., proliferation of the internet) and monitoring technologies have been the genesis for revisions to the privacy laws in most developed countries, including the US, Canada, New Zealand, Australia, the UK, Japan, and a number of European countries (Solove, 2008). Figure 2C in Chapter 3 demonstrates a simultaneous increase in appearances in the two words in books, although likely in separate volumes and disciplines. Hazell (1998) and McDonald (2006) both note the temporal connection between transparency and privacy in law: "many modern democracies have enacted privacy laws at much the same time (shortly before or shortly after) they have introduced freedom of information laws, producing a legislative balancing act." It would seem a balancing effort in organizational behavior and performance, simultaneously considering transparency, privacy, and the mechanisms with which they interface, is warranted as well.

Across very different literatures, a common thread begins to emerge: neither unbridled transparency nor privacy is productive, but some kind of lightweight boundaries—properly located, timed, and designed—might prove to enhance the productivity of work. This chapter has traced the evolution of both transparency and privacy to reach that hypothesis. In the next chapter, extending that logic, I will argue that the combination of both transparency *and* privacy

is more valuable as a management lever than a single ingredient alone. In high-performance settings, the two levers work in conjunction with one another, even if they are opposites, to create a system which, like the optimizing process Altman proposed in Figure 3B, optimizes the balance between organizational learning and operational control.

Chapter 4: Selective Opacities
An Instrumental Value of Privacy and Transparency for Learning and Control

"I'm Yertle the Turtle! Oh, marvelous me!
For I am the ruler of all that I see.
But I don't see enough. That's the trouble with me."

- Dr. Seuss

"The looking glass [from Lewis Carroll's *Through The Looking Glass (And What Alice Found There)*] is a mirror whose reflective character is transformed into a vehicle of transparency. There is a compelling attraction of having the ability and the power to "see through" to the other side, to watch and check what is going on."

- Drucker & Gumpert (2007: 493)

"Someday, perhaps we will look back with nostalgia on a society that still believed opacity was possible—and was shocked to discover what happens when it is not."

- Rosen (2000: 38)

Over the past century of research, one of the great, evergreen questions in the field of organizational behavior has been how much control management should exert over complex organizations and their employees. In their widely-cited review of the evolution of the field of organizational behavior, Barley & Kunda (1992) identify a "tendency for innovative surges of managerial theorizing to alternate between rational and normative rhetorics of control" as the field progressed through five phases: industrial betterment, scientific management, welfare capitalism/human relations, systems rationalism, and organizational culture. Put simply, the field has cycled through phases which have, in alternating fashion, encouraged managers to emphasize control and discipline on the one hand, and flexible learning and innovation on the other.

With each cycle, the field has inched closer to breaking that tradeoff. Taylor (1911) described the control required for scientific management in terms of improving the speed of learning towards the one best way of doing things. When it became clear that one best way could not be permanently engineered but needed to evolve, the human relations school loosened control in order to permit distributed ingenuity. With the advent of organizational learning curves, systems rationalization sought to more closely connect local learning with system learning, thus exerting more top-down control over learning and experimentation. To counteract the dampening effect on speaking up that had on individuals within organizations, organizational culture scholars sought to create environments where top-down control was not absolute but rather vulnerable to pushing back and speaking up. To use now common terminology, prior organizations research looks like a yin and yang oscillation between Theory X and Theory Y (McGregor, 1960).

While at least one scholar has suggested, based on this past oscillating trend, that the next phase post-organizational culture would involve a reversion in the direction of rational control

ideology (Warner, 1994), instead a single construct seems to have captured the middle by seemingly benefiting both learning and control: transparency. From a century-long search, in the field of organizational behavior, transparency has been seen by some as a final solution.

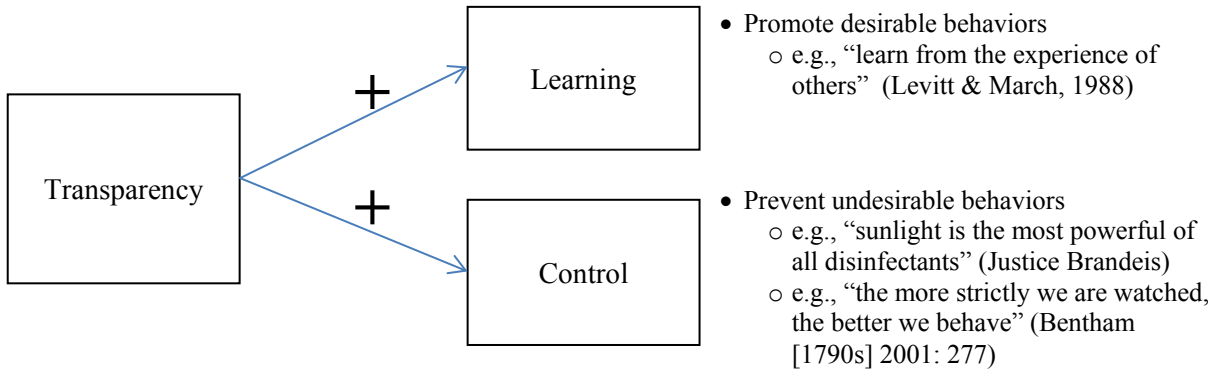
But is it? In real organizations, does transparency bridge the divide between control and learning, such that tradeoffs are no longer necessary? If so, how is it different than Taylor (1911) arguing a century ago that one of the key principles of scientific management, and rational control, is observability or monitoring of work? That tenet has remained intact in each of the subsequent engineering-led approaches to management, including six sigma, Toyota Production System (TPS) (Spear & Bowen, 1999), lean manufacturing, and Total Quality Management (TQM) (e.g., Hackman & Wageman, 1995). Even as recently as TQM, organizational scholars have found it necessary to split TQM into Total Quality Learning (TQL) and Total Quality Control (TQC) (Sitkin et al., 1994) because learning and control, and the circumstances with enabled each, stood in tension with one another.

Senge (1990) sought to achieve control without controlling, which Sewell (1998) reframed as "how do you achieve control without appearing to control?" Sewell answered, drawing on Poster (1990), that the Marxist "mode of production" is being supplemented, or supplanted, by a "mode of information," where "new technology has enabled the erection of a surveillance superstructure throughout society that unobtrusively influences almost all aspects of daily life, especially work life" (Sewell, 1998: 403). Poster called that the "superpanopticon": "today's 'circuits of communication' and the databases they generate constitute a Superpanopticon, a system of surveillance without walls, windows, towers or guards" (Poster, 1990: 93). To the extent that being observed increases compliance through self-discipline, the analogy to Foucault's panopticism is appropriate (Caluya, 2010; Foucault, 1977). In that sense, the renaissance in

organizational *transparency* has, de facto, not broken the tradeoff between learning and control but rather may have fueled the predicted re-emergence of rational control ideology over the past two decades. Lyon et al. (2012: 2) writes, "in many workplaces employee performance is now scrutinized at a level of detail that would delight the early advocates of scientific management." Lohr (2012) calls big data "the descendent" of Taylor's scientific management.

Indeed, there is evidence to suggest that surveillance, particularly digital surveillance, is displacing bureaucracy as the principal mode of control in the workplace (Lyon, 1993; Poster, 1990; Sewell, 1998), and, to some extent, in society (e.g., Power, 1997: 142–147), describing the emergence of an "audit society"). Sewell (1998) and Ball et al. (2012) review the history of scholarship on surveillance as a post-bureaucratic form of control, from scholarly predictions (e.g., Edwards, 1979; Ouchi, 1977; Rushing, 1966) to detailed field studies describing the reality (e.g., Ball, 2010; Carayon, 1993; Garson, 1988; Kallman, 1993; Sewell, Barker, & Nyberg, 2012; Zuboff, 1988). They conclude, "this form of disciplinary power is *productive*, in that it is aimed at prohibiting undesirable behaviors *and* promoting desirable behaviors" (Sewell & Barker, 2006: 935). Figure 4A summarizes that logic:

Figure 4A: Existing Paradigm for the Relationship between Transparency, Learning, and Control



Although that tends to be the model most commonly in use, it also relies on one of two fairly strong assumptions about human behavior: either (1) that being observed does not trigger responses which neutralizes, or reverses, those effects; or (2) that organizational culture, of the sort that Senge (1990) and others have described, is capable of neutralizing such an effect triggered by being observed.

Those are questionable assumptions. There is a great deal of evidence that human behavior changes when watched, including theory presented in Chapters 2 and 3 above. At the most basic level, observation has been shown to automatically and subconsciously activate dominant, practiced responses over experimental, riskier, learning responses (Hackman, 1976; McGrath, 1976; Zajonc, 1965), possibly more so in an evaluative context (Cottrell, 1972; Higgins, 1995; 2001), and has been found to encourage a number of other social facilitation dysfunctions (Bond & Titus, 1983). Similarly, at the group level, increased observability can automatically lead to less effective brainstorming (Paulus, Larey, & Ortega, 1995), blind conformity (Asch, 1951, 1956), and groupthink (Janis, 1983).

The effects of being watched, however, go beyond automatic, subconscious behavioral responses. People also intentionally, even habitually, change their behavior when observed. It is that phenomenon which fascinated Foucault (1977) with respect to the Panopticon. By building prison cells in a circle around a guardpost, all of the prisoners in Bentham's Panopticon would be silhouetted against light coming into the cells from the windows outside of the circle, making prisoner movements visible to a single guard at the center. Whereas Bentham focused on the watcher "seeing without being seen" (Bentham, 1995: 43), Foucault was focused on those who were being watched—for Foucault, the prisoners, not the tower, were at the center of the Panopticon (Elmer, 2012). As Foucault emphasized, the Panopticon's system of control works

even if there is no one in the guardhouse: being seeable, not necessarily being seen, Foucault argued would be enough to produce effective social control. More generally, Foucault (1977) concluded that "awareness of being visible makes people the agents of their own subjection."

And yet in prisons, which so interested Foucault, being "seeable" did not always mean prisoners were accurately observed or transparent. High levels of observability could end up simply generating more complex and therefore harder-to-decipher communication. At the famous Number 4 prison in South Africa, where Nelson Mandela and Mahatma Gandhi were once held prisoner along with thousands of others in overcrowded conditions offering no privacy at all, one of the world's most complex number-based codes for communication among inmates was developed (South Africa Constitution Hill Museum). In Russian prisons, tattoos often served as records of the wearer's gang membership and personal history and were highly coded, so much so that few were able to decode all of them (Lambert, 2003). Where there were no shadows in which to hide, prisoners found a way to hide information in plain sight. Behavior can change under a spotlight, and not necessarily in observable—or desirable—ways.

Such a phenomenon has been found outside of prisons as well. With increases in transparency, scholars have found increases in impression management (Rosenfeld et al., 1995), window-dressing (Prat, 2006: 93), posturing (Walton & McKersie, 1965), pandering (Stasavage, 2006: 169), political correctness (Morris, 2001), and a "chilling effect" on open dialogue (Solove, 2006: 488, quoting Laird v. Tatum, 408 U.S. 1,1,13 (1972)).

In addition to behavioral changes, high levels of transparency in highly complex environments lead to substantial releases of data—more than any person can consume. As Onora O'Neill (2006: 88) points out,

> Indeed, it is often all too plain that the real aim of certain practices of disclosure is not to communicate. Standard practices such as using print so small that many will find it hard to read, or terminology so arcane that most will find it hard to follow, suggest that warnings, documents, and labels are meant to transfer liability without communicating risks effectively. The disclosures made in the small print of insurance policies, in the product leaflets for prescription drugs, and in the product labels on ordinary consumer goods are typical examples of this approach. Information is disclosed, transparency is achieved: but what is going on is not really communication with customers or with the public, but a form of defense risk management, by which companies can claim to have warned those who buy their products, so reducing blame and litigation in the event of mishap, while avoiding genuine communication with those whom they supposedly warn.

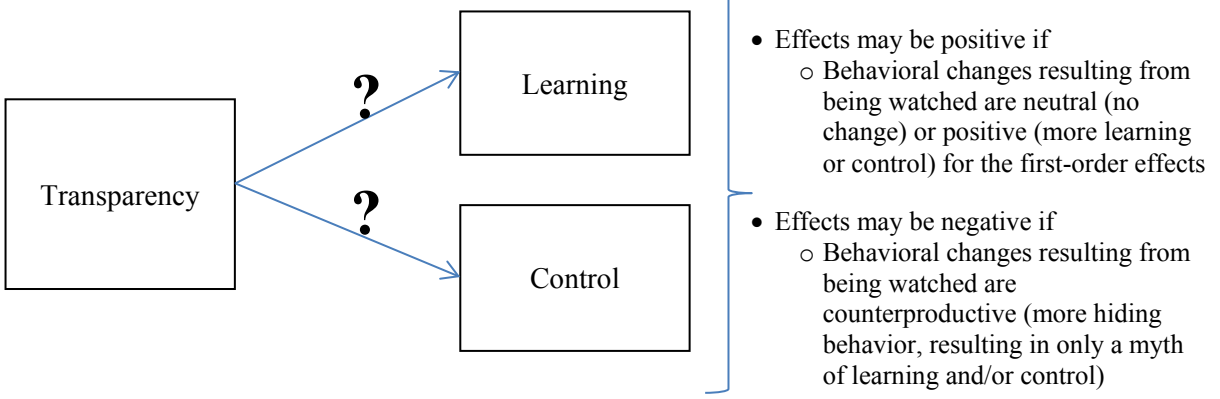
Transparency requires disclosure or dissemination, but not effective communication (O'Neill, 2002, 2006). Transparency can be distracting, and it can distract, in-line with the desires of the observed. Similarly, transparency can create the appearance of meaning where there is none. As Jason Zweig points out, a 47-page mortgage can "lull people into a false sense of security," as "people who provide you with lots of detail seem likely to be honest" (Etzioni, 2010: 6; Zweig, 2009). History demonstrates otherwise.

Transparency also does not guarantee accountability. A common question in inquiries about wrongdoings, both in public and private sectors, is "when did you know" (Hood, 2010: 991)? As much as propaganda may state otherwise, transparency doesn't help answer that question. It can get at "when should you have known," but that is not the way law or even pragmatic inquiry typically works. Thus there is a difference between transparency and accountability, governance, etc.

> If full transparency often leads in practice to politicians, bureaucrats and service professionals putting all their efforts into blame avoidance rather than the taking of properly calculated risks (for instance by classifying all security risks as high), such aspects of good governance may indeed be sacrificed by linking transparency and accountability, producing what is seen as a characteristic failing of public sector organisation by defenders of the limited approach to transparency taken in private corporations (see also Hood 2007). (Hood, 2010: 993)

Stepping back from the literature for a moment, the logic behind this insight is rather simple. Ceteris paribus, transparency reveals anomalies, which is good for both learning and control. But humans may adapt to transparent environments by changing their behavior to hide those anomalies, either by cloaking the anomaly with hiding behavior or conversely burying the observer with some much data that the anomaly gets hidden in the pile like a needle in the haystack. There is an "innate protective instinct" triggered by the knowledge that actions will be observable and public (Detert & Edmondson, 2007: 1; Detert & Edmondson, 2011), and that instinct produces a desire for boundaries to limit observations' spread. So instead of transparency benefitting learning and control, the potential exists for transparency to only generate myths of learning and control, as demonstrated in Chapter 2 and illustrated in Figure 4B.

Figure 4B: Behavioral Model for the Relationship between Transparency, Learning, and Control



How Does Privacy Interoperate with Transparency, Learning, and Control?

The question-mark relationships between transparency, learning, and control in Figure 4B are almost certainly contingency-based relationships. The results presented in Chapter 2 existed in an environment of great variation and change, given the shortened lifecycle of mobile device models and therefore fast production ramp-ups and ramp-downs. The review in Chapter 3 on transparency and privacy is complex in part because so many of the insights are contingent on

the environment. Privacy, alone and in the extreme, cannot possibly be good for learning and control: it hampers sharing and disciplined management. If privacy is beneficial, it will be so because of the nature of the transparent environment, and the degree of transparency, that exists in combination with it.

That insight is common to the nascent research which has tried to put together transparency and privacy into a single model. In public institutions, some ambiguity, enabled by limited transparency, may provide opportunities for institutional flexibility and negotiability (Best, 2005). In negotiation, an ability to discuss facts privately may permit smoother public negotiations (Walton & McKersie, 1965). In deliberative democracy, boundaries between the deliberative body and the public (e.g., a jury room, legislative chambers, etc.) may encourage "less public posturing and little payoff for obstruction" (Heisenberg, 2005: 68; Lewis, 2005; Naurin, 2004; Wallace, 2002), which may explain why the increasingly transparent US Congress and European Commission appear increasingly unable to get things done. In strategy, protecting IP and trade secrets can lead to competitive advantage, but so can sharing knowledge and collaborating across boundaries (Agarwal, Ganco, & Ziedonis, 2009; Anton & Yao, 1995; Arrow, 1970; Hall, 2006; Reitzig & Puranam, 2009). Even in behavioral economics, principal-agent models with imperfect contracting may benefit from less transparency rather than more (Prat, 2005, 2006; Stasavage, 2004, 2006). In each case, the transparency/privacy balance is contingent on the circumstances. As a result, as the theory develops, there is a risk of the answer devolving into a purely contingent answer: it depends.

The historical review of privacy, however, provides some ingredients to avoid that result. Throughout its complex history, privacy has balanced against levels of transparency that favor control over learning. Privacy, in other words, has been a self-regulatory boundary which can

adjust to the needs of the environment at the agency of both individuals and collectives. That is, privacy provides temporary selective opacities within a group, organization, or community.

To say that privacy enables selective opacities is to say that it allows one individual, group, or organization to regulate the level of transparent access by alters to the ego. Like privacy in the Victorian era, that self-regulatory function is important to preserve productive deviance—learning within an environment of control. In the field experiment in the next chapter, the workers identify three functions in which that is the case. As I argue more generally in Chapter 6, privacy provides a buffer from the chaotic attention triggers, for both alter and ego, in an environment with high transparency.

Selective opacities may be important for a number of reasons. They may allow individuals, groups, or even organizations to experiment and learn from errors while at the same time bounding any reputational implications from the mistakes made along the way (e.g., Diermeier, 2011). They may permit individuals, groups, and organizations to avoid being either the paralysis of information overload or "the constraints of conventional views" to be creative and innovative (Simonton, 2003: 484). They may enable trust, ambidexterity, and appropriate power balance as suggested in the previous chapter. They may enable team performance by providing the boundaries required for formation of a "real team" (Hackman, 2002), as both underbounded and overbounded systems underperform (Alderfer, 1976). Ultimately, the reason for the field experiment described in the next chapter is to begin to understand how selective opacities function with respect to performance.

Nonetheless, the combination of the theoretical framing in this chapter, the literature review in the previous chapter, and the qualitative data in Chapter 2 seems to strongly suggest one

finding which provides a foundation for the second half of this dissertation: observation made possible by transparent workplaces, in and of itself, may put a thumb on the control side of the scale at a cost to learning and yet only produce a myth of control due to the hiding behavior that results. If organizations consisted of machines, then there would be no concern: machines, at least those of contemporary times, do their job the same way whether they are being observed or not. Human beings, however, may modify their behavior based on who they are observing, or who is observing them. Designing selective opacities into an organization, in the form of privacy boundaries, therefore can have a substantial impact on productive behavior, as can taking them away to produce greater transparency at work.

Chapter 5: A Tale of Two Privacies
Resolving the Transparency Paradox

"A vain Emperor who cares for nothing except wearing and displaying clothes hires two swindlers who promise him the finest, best suit of clothes from a fabric invisible to anyone who is unfit for his position or "hopelessly stupid". The Emperor's ministers cannot see the clothing themselves, but pretend that they can for fear of appearing unfit for their positions and the Emperor does the same. Finally the swindlers report that the suit is finished, they mime dressing him and the Emperor marches in procession before his subjects. The townsfolk play along with the pretense not wanting to appear unfit for their positions or stupid. Then a child in the crowd, too young to understand the desirability of keeping up the pretense, blurts out that the Emperor is wearing nothing at all and the cry is taken up by others. The Emperor cringes, suspecting the assertion is true, but continues the procession."

Wikipedia, describing Hans Christian Andersen's 1837 fairy tale, the Emperor's New Clothes

"Everyone is happy: management sees what they want to see, and we meet our production quantity and quality targets." This conclusion, voiced by the workers in Chapter 2, may have been true in a world where management was not aware that transparency was mostly illusory. But when we revealed our findings to management, anonymously and carefully, happy was not the overriding response. Nor, for that matter, did I view PrecisionMobile's circumstances as anything other than a failure of organizational learning and operational control.

With the help of my key contact at PrecisionMobile, we convinced management that rather than jumping in to solve the issue, we would instead conduct a series of field experiments that would allow us to more precisely address this issue. The workers' statement that the hiding behavior provided them with the "privacy we need to get our work done" sat at the heart of the puzzle and the investigation. I understood there was a need for privacy, and I believed we could moderate that need if we properly intervened using the tools of organizational behavior.

Because the experiment would take place nine months later, I spent much of the intervening time discussing these results with leading scholars to develop potential interventions. Some thought this sounded like a story around training, others culture, others power, and still others communication. And so I prepared potential interventions around all of those possibilities. The hypothesis was straightforward: the need for privacy emerged because something else (e.g., proper training, sufficient trust, psychological safety, open communication) was missing. If I could understand which of the variables it was, in great detail, then our understanding of the need for privacy would be improved.

I returned to the site with two different undergraduates to be embedded in the lines, one male and one female, and the intention of implementing a field experiment. I again chose to study the lines representing the largest volume product, this time 3G USB datacards, as the mix of the factory production had shifted substantially from phones to wireless data devices over the ten months since the first study. Although the number of operating lines varied by day depending on production needs, on average there were 16 lines producing nearly the same products across two shifts (day and night), or 32 line-shifts total, representing a total production capacity of roughly half a million 3G USB datacards per week. Two lines (four line-shifts) were randomly selected for the experimental condition, leaving 28 line-shifts in the treatment control. Operators had been randomly assigned to lines when the lines were initially staffed, thus ensuring no systematic differences at the outset, and operators rarely permanently switched lines before the end of a product's production life cycle, containing diffusion of the treatment condition across lines. Through the management information systems, I tracked detailed hourly production and quality data for all 32 lines. To supplement the quantitative data, I assigned one embed to a treatment line and one embed to a control line, although neither embed was told details of the treatments prior to implementation. The embeds were onsite for the first five weeks of the five-month experiment, conducted a series of exit interviews, and subsequently stayed in touch with several operators on the line via periodic phone calls to get updates. As before, all conversations were transcribed and translated.

At its best, executing a field experiment is an inductive process that iteratively incorporates the input of the individuals involved (Perlow, 1999). In preparation for the experimental treatments, I asked PrecisionMobile's engineering department to put up a curtain between an adjacent pair of experimental and control lines (F62 and F64) to avoid cross-treatment

contamination (Figure 5A). In this setting, changes to the factory environment are common, so a change such as the curtain was not out of the ordinary. Given the repetitive nature of the work tasks, however, environmental changes typically serve as topics of conversation, as did this one. The embeds reported multiple theories circulating among the operators on the purpose of the curtain. When the curtain bar was initially hung from the ceiling, "people joked that they could hang their clothes on it." When the curtain went up, an operator "made a swine flu joke out of it, saying that people with the disease will be quarantined on the other side." And then the operator adjacent to one embed said, "Wouldn't it be nice if they hung up curtains all around the line, so we can be completely closed off? We could be so much more productive if they did that." Although the originally planned intervention involved ways of achieving increased transparency, not less, I decided to implement her idea in place of our own. Starting several days later, for five consecutive months, the four experimental lines operated inside the equivalent of a hospital bed curtain (Figure 5B).

Figure 5A: Illustrative Layout of Factory Floor (All Experimental and Control Lines)

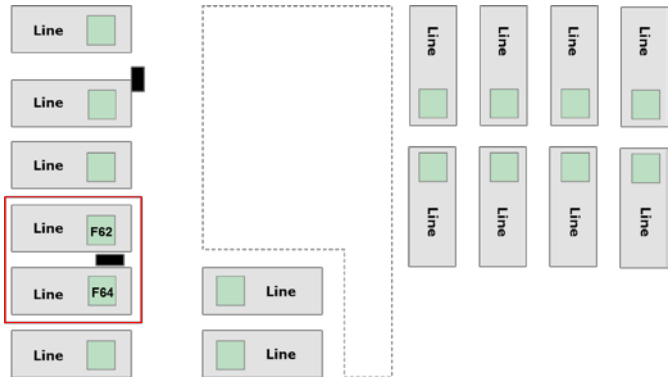


Figure 5B: The Curtain Intervention

The top-left and top-right photos show one of the experimental lines from outside the line looking in, first without the curtain (left) and then with the curtain (right). The bottom-left and bottom-right photos show the same experimental line but from the inside looking out, first without the curtain (left) and then with the curtain (right).

To ensure a clean experimental design, in which the relationship between privacy and performance was accurately instrumented, I painstakingly controlled for Hawthorne effects. A Hawthorne effect, first understood through the research done at the Western Electric Hawthorne Works in the 1920s and replicated elsewhere, refers to a circumstance in which subjects improve the aspect of their behavior being experimentally measured simply in response to the fact that they are being studied, not in response to any experimental manipulation (Mayo, 1933; Roethlisberger & Dickson, 1939). Although the presence of a Hawthorne effect has been called into question (Carey, 1967; Jones, 1992; Levitt & List, 2009), anticipating a potential Hawthorne effect, I carefully designed this field experiment to avoid it. Because the same space is used by the day and night shifts, the curtains—once installed—were present for both shifts, but the night shift was under the clear impression that the curtains were "for something that the day shift was doing," an impression the research team heard about but neither created nor disproved. The

proliferation of that impression among the night shift thereby eliminated the possibility that changes in the night shift's performance were a response to feeling special or believing that they were being studied, because they did not think they were. Rather, any changes to the night shift's performance could be tied to the reduced transparency afforded by the experimental treatment, i.e., the curtain.

Results

Performance on each of the four lines surrounded by curtains, measured in defect-free units per hour (UPH), increased by as much as 10–15 percent after the first week and maintained a lead over the 28 control lines for the remaining five months of the experiment. Figure 5C provides a graphical representation, as well as reflecting changes in operating days over the study period. The pre-curtain period includes 55 operating days from May 1, 2009 through June 27, 2009. The post-curtain-installation period includes 142 operating days from June 28, 2009 through November 30, 2009. There was no production on May 1, May 28, and October 1–3 due to national statutory holidays in China. There was no production on June 28–30, August 1–2, August 29, October 6–8, and November 9 due to line maintenance and inventory counts. There was no production on May 3 and July 19, both Sundays, due to insufficient production demand to drive Sunday overtime.

Figure 5C. Line Performance on Experimental and Control Lines

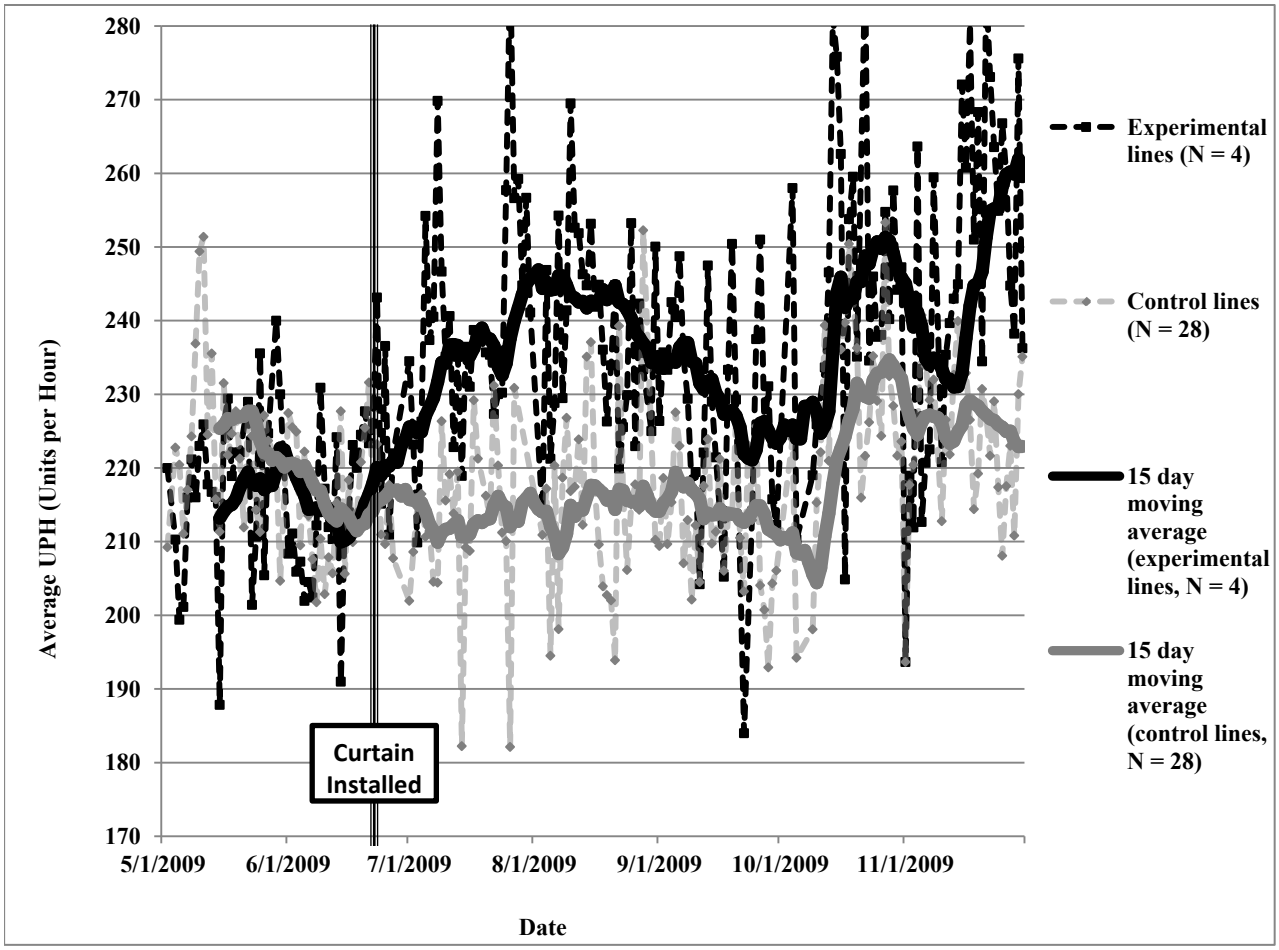


Table 5A gives descriptive statistics for each relevant grouping of lines. Operators rotate, as a line, between day and night shifts roughly every month. From May 1 to November 30, 2009, the lines being studied shifted between day and night shifts on May 28, June 30, August 1, August 29, October 6, and November 9. The "rotating" figures in Table 5A reflect production keeping the operator group constant (i.e., it tracks the production of a specified set of people who were initially on the day or night shift at the start of this study). The "day" and "night" figures in the table track production on those shifts, regardless of the rotation of the operators. The

Table 5A. Line Performance Descriptive Statistics in Units per Hour (UPH), Grouped by Treatment and Control Groups			
	Mean	**S.D.**	**Median**
All shifts			
Control lines, pre-curtain	219.071	12.679	219.359
Control lines, post-curtain	218.158	16.359	217.881
Treatment lines, pre-curtain	216.013	16.212	217.820
Treatment lines, post-curtain	240.027	24.924	238.352
Day shift			
Control lines, pre-curtain	219.230	11.352	219.927
Control lines, post-curtain	215.400	16.046	214.394
Treatment lines, pre-curtain	220.122	13.984	222.161
Treatment lines, post-curtain	233.052	21.454	232.200
Night shift			
Control lines, pre-curtain	218.913	13.986	218.025
Control lines, post-curtain	220.917	16.260	220.573
Treatment lines, pre-curtain	211.739	17.369	213.752
Treatment lines, post-curtain	246.949	26.245	246.370
Initial day shift (rotating)			
Control lines, pre-curtain	219.534	12.033	220.646
Control lines, post-curtain	216.579	19.982	217.620
Treatment lines, pre-curtain	215.350	17.036	217.639
Treatment lines, post-curtain	237.983	22.843	238.352
Initial night shift (rotating)			
Control lines, pre-curtain	218.609	13.390	218.750
Control lines, post-curtain	217.271	16.869	217.582
Treatment lines, pre-curtain	216.675	15.487	219.583
Treatment lines, post-curtain	242.056	26.765	238.661

descriptive statistics demonstrate the degree of improvement on the experimental lines. Because accepted wisdom at Precision held that the night shift's performance at this site was lower, Table 5A breaks out the day and night shifts individually. Because operators on the line cycle from day shift to night shift monthly or semi-monthly (i.e., operators on Line F60-Day rotate together to Line F60-Night and vice versa), for purposes of excluding the Hawthorne effect as a potential explanation for the performance improvement, it was necessary to follow the groups of people as they rotated back and forth. The last two sections of Table 5A show descriptive statistics for those groups. Even as lines rotated, my embeds confirmed, operators did not communicate across shifts, as one shift was sleeping while the other was working.

A difference-in-differences estimation model confirms this performance improvement result and permits a more disaggregated, hour-by-hour analysis of the data. Difference-in-differences estimation has become an increasingly popular way to estimate causal relationships (Bertrand,

Duflo, & Mullainathan, 2004) and consists of first identifying a specific intervention or treatment and then comparing the difference in outcomes, before and after the intervention, for groups affected by the intervention to the same difference for unaffected groups. Difference-in-differences estimation models have three primary advantages: simplicity, the potential to circumvent many of the endogeneity problems characteristic of cross-sectional analysis, and robustness, assuming appropriate corrections for serial correlation are made (Bertrand et al., 2004). The basic estimation model is:

$$Y = \beta_0 + \beta_1 * dExp + \beta_2 * dTime + \beta_3 * dTime * dExp + \varepsilon \qquad (1)$$

where Y is the units per hour produced on the line, dExp is a dummy variable expressing whether a line is an experimental (1) or control (0) line, dTime is a dummy variable expressing whether the time is before (0) or after (1) the intervention, and dTime*dExp is the interaction of the two (Figure 5D provides a summary). I avoided selection endogeneity by randomly selecting treatment and control lines.

Figure 5D: Summary of Experimental Variables

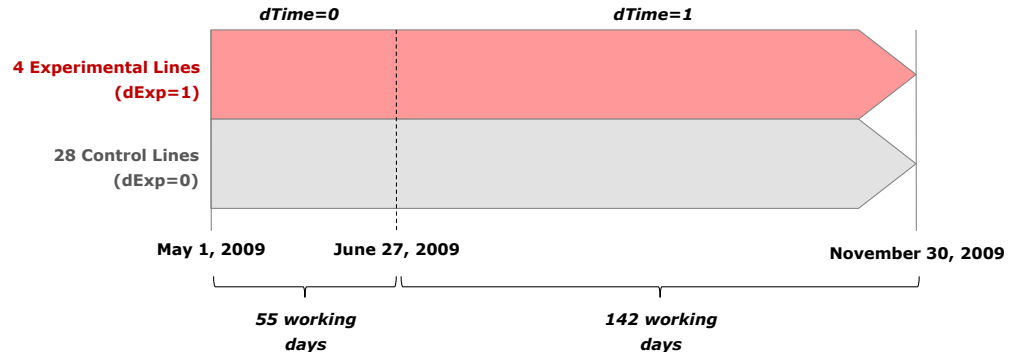


Table 5B. Difference-in-Differences GLS Fixed-Effects Models of Performance in Units per Hour (Means)

Variable	Grouped shift average (1)	Grouped shift average w/ night/day (2)	Shift average w/ line fixed effects (3)	Shift average w/ line and day fixed effects (4)	Hourly w/ line fixed effects (5)	Hourly w/ line and day fixed effects (6)	"Pre" vs. "post" average line performance (7)
dExperiment	-3.0589	-3.0031	-13.8405***	-12.8712***	-10.8821***	-11.0778***	1.9609
	(2.0120)	(2.1103)	(4.1962)	(4.4123)	(4.2604)	(4.3133)	(6.7335)
dTime	-0.9136	-0.9136	-1.0369	-1.0297	-0.5343	-3.6684	-5.2705
	(1.5711)	(1.5897)	(2.0320)	(6.2442)	(1.4557)	(34.1629)	(3.9941)
dExperiment * dTime	24.9283***	24.8616***	16.2871***	16.7360**	14.5674***	14.5173***	21.2457**
	(2.7269)	(2.7729)	(3.6463)	(3.6777)	(2.6433)	(2.6998)	(9.5666)
dNight		5.6835***	-10.2238*	-8.8509	-67.1293***	-65.3274***	
		(1.4087)	(6.1304)	(6.4850)	(6.2139)	(6.7010)	
Constant	219.0714***	216.2296***	217.4635***	216.0429***	215.8333***	195.2289***	203.2387***
	(1.2176)	(1.4055)	(2.8986)	(6.3682)	(3.4439)	(12.5507)	(2.7490)
R-squared	0.2307	0.2474	0.1084	0.2186	0.0299	0.0531	0.2206
Observations	741	741	2799	2799	25040	25040	46

* $p < .10$; ** $p < .05$; *** $p < .01$.

* Models are GLS fixed-effects models with heteroskedasticity-robust standard errors in parentheses. Models 3–6 include fixed effects for lines, which are not shown. Models 4 and 6 include fixed effects for day, which are not shown. Model 7 is a robustness check based on Bertrand, Duflo, and Mullainathan's (2000) suggested remedy (for a small number of groups) for potentially inflated standard errors of difference-in-differences estimates due to serial correlation with data from a large number of periods.

Table 5C. Difference-in-Differences GLS Fixed-Effects Models of Performance in Units per Hour (Variance)

Variable	Grouped shift average (1)	Grouped shift average w/ night/day (2)	"Pre" vs. "post" average line performance (7)
dExperiment	-2.9878	-2.8691	-0.4679
	(2.0593)	(1.9957)	(4.8437)
dTime	6.3223***	6.3543***	-7.5818***
	(1.3972)	(1.3603)	(2.5245)
dExperiment * dTime	0.7292	0.7009	1.8473
	(2.5430)	(2.4793)	(6.5833)
dNight		6.0836***	
		(1.2009)	
Constant	56.5703***	53.4399***	71.5249***
	(1.0741)	(1.1603)	(1.9674)
R-squared	0.0365	0.0690	0.2121
Observations	741	741	46

* $p < .10$; ** $p < .05$; *** $p < .01$.

* Models are GLS fixed-effects models with heteroskedasticity-robust standard errors in parentheses. Model 7 is a robustness check based on Bertrand, Duflo, and Mullainathan's (2000) suggested remedy (for a small number of groups) for potentially inflated standard errors of difference-in-differences estimates due to serial correlation with data from a large number of periods. Models 3-6 are excluded for collinearity reasons: the dataset does not include detail on performance (and therefore variance) at more than hourly frequency, and thus there is no variance measure at the hourly level.

Table 5B reports the results of the difference-in-differences estimation models for mean hourly performance. In model 1 and model 2, performance is measured as an average of the units per hour produced per shift on the experimental and control groupings of lines. Model 3 and model 4 disaggregate the groups into individual lines, using instead the average unit per hour production of each individual line as the dependent variable. That disaggregation also permits controls for line fixed effects in both models 3 and 4 and day fixed effects in model 4. Models 5 and 6 disaggregate the shift production averages into actual hourly production, again controlling for line fixed effects in both models 5 and 6 and day fixed effects in model 6. In each model, the interaction term dTime*dExp is highly significant and positive, indicating a sustained and significant improvement in production on the lines surrounded by curtains.

As difference-in-differences estimates have been shown to suffer from inflated standard errors due to serial correlation with data from a large number of periods (Bertrand et al., 2004), I used Bertrand, Duflo, and Mullainathan's suggested remedy of collapsing the time series information into a "pre" and "post" period by group, which they argue to be valid when a small number of groups is involved. Doing so, in effect, takes into account the effective sample size and thus avoids over-estimation of significance levels. In this study, each of the 32 lines represents a "group" as defined by Bertrand and colleagues, with "pre" and "post" periods defined as the time before and after the curtains were installed. As shown in model 7, the dTime*dExp variable remains significant at a 5-percent significance level.

A ranking of lines before and after provides a simple summary. In the 55 working days prior to the experiment, the experimental lines were fairly evenly distributed in terms of average daily performance, as the third, seventh, fifteenth, and twenty-first most productive lines (out of 32

total). During the 142 days of the experiment, those same lines were the first, second, third, and ninth most productive lines.

Meanwhile, the rank order in terms of variance did not change meaningfully. In the 55 working days prior to the experiment, the experimental lines were fifth, nineteenth, twenty-fourth, and twenty-fifth in variance. During the 142 days of the experiment, those same lines were fifteenth, eighteenth, twenty-first, and twenty-second. Table 5C provides more detailed analysis on variance, producing the same difference-in-differences estimates for variance on the dependent variable (units per hour) in place of means. While variance seems to have increased over time across the factory floor (dTime shows a significant and positive increase on variance), the curtains themselves appear to have not caused increased variance in performance on the experimental lines relative to the control lines. This variance result will be revisited in the discussion in Chapter 6.

The qualitative data collected by the embedded participant-observers on the line during the first month of the experiment, supported by a series of 15 detailed interviews conducted by the participant-observers after the experiment, offer highly detailed accounts of the mechanisms behind this performance improvement. According to the operators on the line, three categories of changes contributed roughly equally to the boost in performance: (1) privacy to permit *tweaking* the line as temporary issues arise (productive deviance); (2) privacy to permit *experimenting* with new ideas prior to explaining them to management; and (3) privacy to permit *avoiding interruptions with negative consequences* from outside of the line without engaging in value-reducing hiding activities.

Tweaking: Real-Time, Temporary Adjustments to the Line

The manual assembly of 2,400 devices per shift involves the timely and intricate mixture of three sets of ingredients: roughly a million components, approximately 100 assembly tools, and roughly six dozen people—half line operators, half functional support (e.g., materials, quality assurance) or experts (e.g., process engineers, industrial engineers, or technical engineers). There can be great variance in each of those ingredients: components can be defective, assembly tools can break down, and human beings can have bad days. As one line supporter explained,

> When unexpected things happen, operators need to tweak the line to solve the problem, minimize its impact, and stay on track to meet our production target. But if anyone outside of the line catches us operating in non-TQC ways [i.e., not according to the total quality control charts posted in front of each station], they will blame the problem on the fact that we are not following the TQC, even though that's the solution to the problem and not the problem itself.

When problems arise, problem-solving activities attract attention to the line, thereby making it harder for operators to tweak their activities. Instead, they end up "slowing down or even stopping the line and waiting for experts to come and solve the problem," which "can take a long time," according to several of the operators the embeds interviewed. For example, one embed witnessed the emergence of a significant bottleneck on her line that "drew management attention immediately but then led to a two-hour wait before the correct process engineer could authorize an official fix to the problem."

The curtain changed this dynamic significantly. Whereas privacy to tweak the line had previously been achieved through carefully hiding the adjustments, the privacy curtain substituted for that hiding behavior, making tweaking *within* the curtain far more transparent to other operators on the line. The curtain provided privacy for "incubation" and "elaboration" of

their ideas with relevant others (Csikszentmihalyi & Sawyer, 1995: 340,344). Tweaking was particularly prevalent with respect to allocating tasks to workers, one traditional form of productive deviance. As temporary bottlenecks arose, "workers moved fluidly to reduce them"—the line's own form of organizational improvisation (Barrett, 1998). Having previously observed workers dedicated exclusively to one station for months or even years, after the installation of the curtain, the embeds were "surprised at how many of the operators had cross-trained themselves on other stations, especially those immediately adjacent to their own." The workers reported this fluidity to us as "making the line feel more like a team." In fact, the operator who originally suggested the curtain, when interviewed at the end of the experiment, told us that "when I brought up that suggestion, I was thinking that the curtain could potentially make our line look more like a team, so that the whole production can be team work." The curtain transformed the work from individual to collective via common knowledge (Chwe, 2001), even without changing the tasks themselves. Just as strategic alliance teams are more successful with space to "learn to work together away from the spotlights" (Doz, 1996: 68), team learning at Precision benefitted from the curtain's shield against the spotlight of the factory floor. The line leader was clear that serious line problems, including persistent bottlenecks, would still be resolved by "opening the curtain and escalating the problem to engineering or management," since that was "their job" to fix. But temporary issues that could be solved or at least mitigated locally would be handled by the line, through line-level learning, "to avoid slowing down production in the short term." The engineers were still observing the performance of the lines electronically at their server stations, so when the line went down, "they would arrive on their typical schedule," no faster or slower than before the curtain. Although not all tweaks were beneficial, the performance data are

unequivocal in demonstrating, on the whole, that they were positive for line performance, both for the day shift and the Hawthorne-controlled night shift.

In addition to static line improvements upon installation of the curtain, the effectiveness of tweaking also improved dynamically over the five months of the experiment. The curtain, while shielding tweaking from immediate interruption, simultaneously provided the privacy necessary for operators to engage in activities intended to improve their capability to tweak. For example, one embed reported that "when people weren't as busy [during unavoidable production downtime and/or lower target production days], I saw people switch roles a lot so that they can learn multiple tasks." This sort of cross-training would have been nearly impossible in the visible condition because it would "draw attention to the line," but with visible privacy, operators were able to self-train in order to make the line more fluid for future tweaking.

Self-training extended beyond switching tasks to attempts to increase the scope of what could be safely and effectively tweaked. For example, one of the challenges for operators was that "most of the computer-based tasks, including stations designed to load software onto the devices, test the software, and test the send/receive transmission functions, was run using English-based software"—an unavoidable circumstance for PrecisionMobile, as the proprietary software was provided by an English-based engineering division of this customer's (OEM) organization. As a result, "computer training for operators involved memorizing a specific set of actions": when the embed was trained on the computer, she was told "click the first button here, and the second button here, when this menu comes up, click this button, and then pick the third one from the top." Because she understood English, the embed learned it quickly. But for the average operator, "the process involves rote memorization." When the process works properly, a green "OK" pops up on the screen and is recognizable. But error messages in red are typically "undecipherable to

operators, requiring them to stop and wait for an engineer to come fix the problem for them"—a problem they could often fix themselves if they understood the error message (often as simple as "software upload failed—please try again"). On the first day after the curtain went up, an embed observed the line supporter on one of the curtained lines instructing

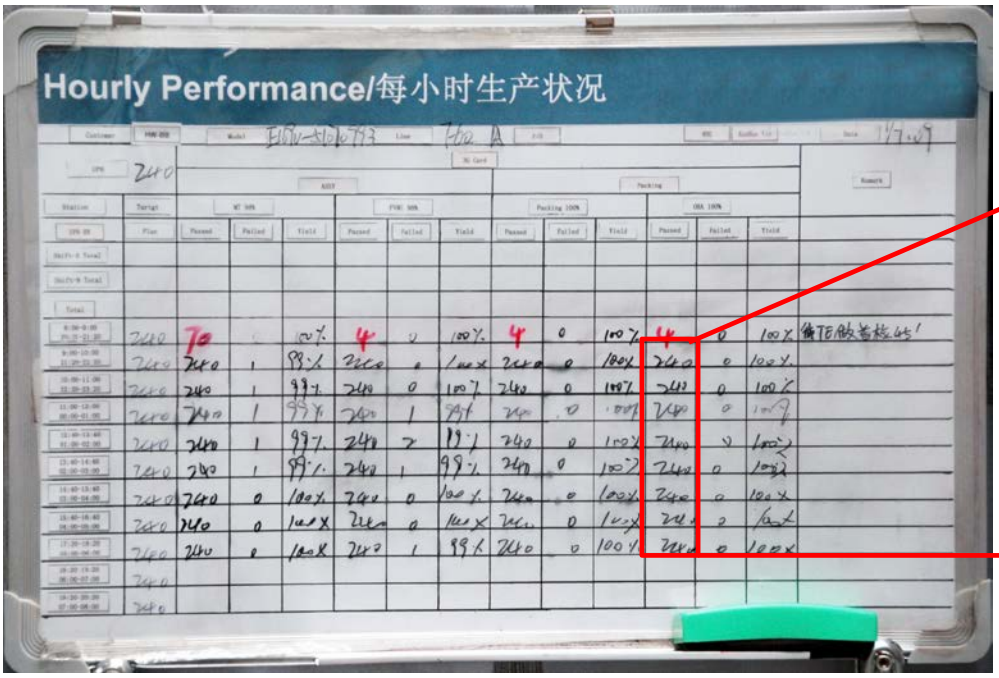
> . . . everyone, especially those at the computers, to copy down error messages they don't understand while they were working. So a couple of women who work with me at the scanning stations were copying down words constantly. Anything red came up, she was writing them down and trying to figure out what they mean. They were being very diligent about that . . . I was really impressed.

The line supporter subsequently "brought that list to a cooperative English-speaking engineering manager, who helped him translate. He posted the translations next to the computer so that operators could problem solve themselves," when possible. For a different computer terminal, which spit out error messages in programming code, they pursued a similar strategy. As a result, the line became better and better, over time, at tweaking the process such that they could maintain production speed in the event of temporary issues, which were reported to the engineering department in parallel (automatically via the IT system) for ultimate resolution.

Ironically, operators explained that although the privacy curtain permitted tweaking, it was the resulting transparency that emerged inside the curtain that allowed it to be effective. The purpose of tweaking was, as before, to "ensure that production and quality targets were met." For the "team" to be effective in knowing when to tweak, progress toward targets needed to be transparent. The operators' solution to this was also noteworthy: first, they moved the production reporting whiteboards outside of the curtain and continued to "smooth" the hourly reporting such that targets were consistently and smoothly met; then, they put the actual production, as tracked in real time by the IT system, on several computer monitors around the line "so that members of

the line would always know whether they were actually on track to meeting targets." Carrying that idea one step farther, they subsequently asked the engineering department to "install a large monitor at the end of their lines [inside the curtain] to show simply their shift's production target [manually entered] and their real-time progress towards that goal." Figure 5E provides photographs of the whiteboard outside the curtain with the smoothed hourly reporting and the computer monitor inside the curtain that was tracking real-time production.

Figure 5E: Photos of the Factory Floor Before and After the Curtain



Actual (according to real-time IT tracking system)

240
80
200
280
280
80
289
271
200

As shown by this photograph of a whiteboard outside one of the curtained lines, hourly production reporting was smoothed to meet the hourly target of 240 units per hour. Each row on the board represented an hour of production time. From right to left, the first column recorded the hour, the second column recorded the target (240), and then each set of three columns recorded a count of defect-free output, a count of defects, and the yield ([defect-free output-defects)/defect-free output] for each stage of assembly and packing.

The production values to the far right were subsequently pulled from the IT system which automatically tracks production based on a scanner on the assembly line. While the hourly values do not match, the totals (1920) do.

Operators on the curtained lines subsequently asked for monitors to be installed to track the real-time production of their lines (the same data as shown to the right of the photo of the whiteboard), which was visible only inside of the curtain. A simple computer program was created to show (from top to bottom) the start and end of the shift, the product being made, the target shift production (2370), the actual number made so far (480), the amount of production remaining (1890), and the percent completion (20.3%).

Group-level privacy was effective in creating a knowledge-centric in-group and out-group (McGrath, 1984), although the qualitative data suggest that the productivity improvement was due more to the benefits of privacy itself than feelings of in-group and out-group. In the embeds' view, cultural norms in China made it particularly inappropriate to point out others' mistakes publicly, especially when those others were not junior to the individual in question. By adopting processes that were better than others' plans, "an operator would essentially be pointing out another's mistake publicly, if observed by others—and especially if observed, by chance, by the person who came up with the original process." The more culturally appropriate approach was to hide the improvement. The curtained boundary, by providing visible privacy, had removed the need for encryption, but only within the curtain, where the individual was certain that the original inventor would not see.

Experimenting with New Knowledge Before Sharing It

In concert with temporary tweaking, visible privacy appears to have encouraged operators within the curtain to "experiment with an increased number of permanent improvements to the line." Upon the curtain going up, one embed commented that the supporter on her line "walked around the line and was being very quiet, staring at every single station, pondering it for a while, looking for any possible improvement." The embeds, for example, tracked a list of 16 innovations with which the operators experimented during the first week of the five-month experiment. Based on the embeds' experience on the line, they reported that the "innovations were a mix of preexisting and new ideas: some of these were ideas that were just waiting for an opportunity at experimentation, while others reflected novel learning on the line through the increased levels of experimentation the curtain enabled."

The visible boundary provided by the curtain enabled experimentation through two mechanisms. First, it "allowed the line to collaborate on new ideas." As one line supporter explained prior to installation of the curtain, "When we experiment with changing these things, when we are in a small clump discussing issues, or when we help each other when we move around and do things that we are technically not allowed to do, how do we stop the 6S people, the QA people, and the general managers from coming around and questioning us? Sometimes [observers] don't even have authority over our line, but they still intervene." Second, the curtain provided the flexibility that has been deemed necessary to create successful prototypes of process innovations before sharing them (Thomke, von Hippel, & Franke, 1998). As an operator who contributed a number of new ideas explained after the experiment, "We have all of these ideas . . . but how do we feel safe to try them? We'll experiment as long as the consequences aren't so great. As long as the price we pay isn't so great." When senior managers later heard these quotes, they were surprised. Precision not only encourages learning on the line, but they are constantly searching for productivity improvements, as every little idea contributes to their razor-thin margins. Senior managers immediately questioned "why middle managers were not taking advantage of these ideas." But a question made them pause: how was middle management to evaluate whether these ideas were good or not? The only way to evaluate these sorts of manual process innovations is to prototype them, analyze the performance changes, and then make a decision. Trying new ideas, however, could happen only at the expense of variation from exploiting existing best practices, and that was a tradeoff that middle management had insufficient incentives to make (March, 1991). The best people to make such judgment calls were those individuals who actually completed these tasks 2,400 times per day: the operators.

The privacy curtain provided operators with just enough privacy to experiment within the bounds of acceptability, enabling on-the-line experimentation. Having produced 2,400 units per day, often for months or even years, individual workers had developed a number of bottom-up innovations to improve existing processes, which needed trial-and-error experimentation to prove, disprove, or develop further. Under the observation of management, the cost to the workers of sharing, explaining, and/or fighting for their innovations "simply outweighed the benefits," a finding consistent with organizational learning failures previously observed in nursing operations (Tucker et al., 2002). Some degree of privacy was required to experiment, develop a prototype process, and prove the concept prior to sharing. Figure 5B provides photographs showing operators at their own stations and operators in the curtained line congregating at one station to solve a problem, something that would not have happened when the line was always observable.

Even with the curtain, sharing remained an important part of the process, not just for organizational learning but also for the operators themselves. The "pride of using an improvement to produce faster than the other lines" was at least a part of the motivation driving operators to experiment. Operators from different lines would often compare, late in the shift, various lines' production for the day, with "admiration" offered to the top achievers followed by peer-to-peer demonstrations of "how they made so much so quickly." Even the embeds picked up this habit: evening debriefings naturally tended to start with some form of the phrase, "we made [this many] devices today." While the factory provided excellent working conditions for China, factory life was not easy, and a great deal of encouragement took the form of peer-to-peer factory floor wisdom. When one of the embeds asked why she should bother to do any more than the minimum, one of the factory women responded, "if you quit, then they have won. If you

want to win, you stick here and you work your hardest and you prove to them that they are wrong [about your lack of ability to make it in this environment].” Sharing a real improvement, home-grown by an operator on the line, was one of the best forms of winning.

Even when pride was insufficient to motivate sharing, good ideas spread quickly. While activity on the line became less visible with the curtain, line performance and quality remained extremely transparent. According to an operator after the experiment, it “took about a month for the analysts to notice, in their monthly report, the performance improvements” that resulted, but once they noticed, there were “plenty of people going inside the curtain to see what was different.” A line leader told us that the analysts also noticed the increase in variance on those lines, but any concerns about the increased variance were quickly “overlooked in light of the interest in the increased performance.” The curtain provided sufficient privacy to keep the unwanted variance under the radar long enough to generate a proof of the benefits from experimentation.

Avoiding Interruptions with Negative Consequences: Benefits of Management by Standing Still

A third source of the curtain’s performance boost came simply from removing the need for operators to engage in many of the non-value-added hiding activities. The system of codes and hiding behaviors that operators adopted when being observed reduced productivity, and those non-value-added hiding activities were both systematic and non-trivial. As one embed explained,

> The wording that the supporter used for watching out for managers was “fang shao.” In Chinese, that phrase refers to the lookout person traditionally assigned to watch out for cops during an illicit activity, or during war to watch out for enemy activity while the rest of the unit is doing something. So the supporters think that’s part of their job—that’s part of what they are supposed to do in their daily organizational lives.

And when the signal is given, everyone assumes the hidden, less-productive version of their working task. From a productivity standpoint, both the lookout and hiding activities represented a waste of time and effort. As one operator said simply, "If we didn't need to hide things from the management levels, we could finish production so much faster." That indeed appears to have been true.

Even if visits by managers with formal authority over the line were relatively infrequent, others could provide an equivalent interruption. Categories of work interruptions include both intrusions and disruptions (Jett & George, 2003), and the curtain enabled the reduction of both, especially those that had a negative effect on productivity. As one line leader explained, "People who have nothing to do with this line need to get away, because materials people, random engineers, random management . . . they come around and distract you. That's the first reason—because they come and chat with you, they chat with your neighbor, and that distracts you. And sometimes they play with your material . . . it's distracting." As an operator added, "It's already hard to keep track of everything and make sure I do everything correctly. They come around, they pick up a card, they play with it . . . then I have to pay attention to the card that they are playing with, make sure they don't break it, make sure they don't walk away with it . . . it's just extra wasted time that I don't have." The privacy of the curtain thus permitted added concentration on the tasks of the line. With fewer visual distractions and physical intrusions, it also focused operators' attention on the social unit inside of the curtain (Dunbar, 1992)—on both the people and the tasks contained on the line—much the way psychotherapists set up therapy environments to keep patients "on-story" by shutting out extraneous stimuli (Gabbard, 2005). This, one operator explained, is what led to a stronger sense of "team spirit" on the line. Perhaps the best indicator of this spirit was the fact that the curtained lines quickly also became the

loudest, with the most talking inside. While one senior leader from a different line "really dislikes people talking during production because she thinks it slows down the production," the curtain provided a boundary to minimize her impact on the line that was not hers to manage.

Interruptions can also have a positive impact on productivity (Jett & George, 2003: 497; Staats & Gino, 2012) by providing variety, motivation, stimulation, or valuable perturbations, so a blanket removal of intrusions could have a negative effect on organizational performance. Interestingly, the curtain appears to have been sufficiently permeable to block many negative intrusions and disruptions without impeding all positive ones. Managers could still come and go as they pleased, and those interruptions—although now perceived to be "less frequent"—were reported to be "more valuable," on average. As one line supporter explained, "When management comes into the curtain now, it is more often for good reasons. People only come to this line when it is a purposeful destination, not when it is a convenient place to stop, look busy, and be an imposition." Although PrecisionMobile, like many organizations, encouraged management by walking around (Peters & Waterman, 1982: 121), an incremental increase in the time management spent standing still, due to the reduced observability and access enabled by the curtain, appears to have had a positive impact on performance.

Ironically, operators also saw a downside to this aspect of the curtain. In interviews after the experiment, several operators mentioned that the curtain prevented them from "seeing the management coming as quickly" and therefore occasionally put them at greater risk of being "caught doing something [they] were not supposed to be doing." But here, too, operators learned to improvise. Movement of the curtain by the entrance to the line became a signal of possible intrusion and triggered caution on the line. To avoid triggering that response themselves, operators started using the back or side exits rather than the front. Beyond the curtain, nothing

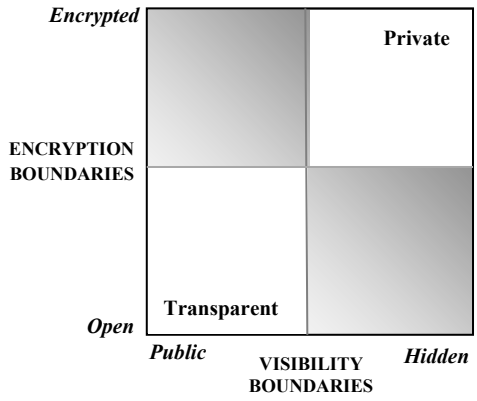
had changed. Inside the curtain, however, transparency replaced the previously prevalent and highly guarded hiding behavior.

TWO FORMS OF PRIVACY

The research at PrecisionMobile illustrates the transparency paradox: observability may *reduce* performance by inducing those being observed to conceal their activities through codes and other costly means; conversely, creating zones of privacy may, under certain conditions, increase performance. Existing theory predicts that reduced observability will reduce both organizational learning and operational control, at a detriment to performance. At Precision, however, reducing observability simply dissolved the myths of control exposed in the initial qualitative research, while improving mechanisms for learning. As a result, through improved tweaking, experimentation, and distraction avoidance, group privacy enhanced performance.

At the heart of this finding is a question: when desired, how is group privacy achieved? A review of the philosophy literature on privacy supports the logical conclusion that it is accomplished in only one of two ways: either by blocking observability of people's actions through visibility boundaries, such as private offices, team meeting rooms, war rooms, or phone booths, or by blocking understanding of people's actions through encryption boundaries, such as the codes used by the mafia (Blok & Tilly, 1975; Gambetta, 1996), finals and eating clubs (Karabel, 2006), and the CIA (Marchetti & Marks, 1974). We either close the door, window, or curtain, or we speak in code that only chosen others can interpret. Because these two forms of privacy are substitutes in most cases, few organizations find the need to construct both. In either

Figure 5F. Forms of Privacy



case, we achieve privacy and reduce transparency by creating either visibility boundaries or encryption boundaries to separate the private from the transparent. Figure 5E diagrams the means of achieving privacy by creating such boundaries.

Why would groups, such as the lines studied at PrecisionMobile, choose one mechanism of privacy over another? Though the literature is silent on that question, this research suggests that encryption boundaries are costly to construct and deconstruct, given operators' complaints about the energy they needed to invest in efforts to hide behavior. Logic would therefore dictate that encryption boundaries would be reserved primarily for illegitimate hiding—as Schwartz (1968: 742) stated in paraphrasing Simmel (1964: 347,364), "where [visibility-based] privacy is prohibited, man can only imagine separateness as an act of stealth." When privacy can be legitimized through physical boundaries, the need for costly "stealth" encryption dissipates.

How group privacy is achieved in organizations is therefore both a behavioral and a contingency-based phenomenon, as suggested in previous chapters. Organizations decide how much visible group privacy to support; then groups decide how much code to implement to make up for remaining, unmet privacy needs. Ultimately, there may be agency at both senior levels (design) and lower levels (code) of the organization, with the lower level's code contingent upon the senior level's design.

PrecisionMobile is no exception. Prior to the installation of the curtain, transparency imposed through public visibility encouraged individuals to create privacy through encryption—a code that only peers could decipher—without the knowledge of management. With the installation of the curtain, a boundary to visibility was created, allowing operators to unencrypt their communication. For operators, encryption was a cost-benefit decision: with the installation of the

curtain, the benefit of encryption was reduced, while the cost of maintaining the code remained the same. Thus the data demonstrated a contingent model of transparency: operators determined how to satisfy their instrumental needs for privacy depending on how transparently management designed their environment. At least at Precision, aiming for the high-visibility, low-encryption quadrant of Figure 5F (bottom-left) would simply result in a high-visibility, high-encryption outcome (top-left), while aiming for the low-visibility, high-encryption quadrant of Figure 5F (top-right) would result in a low-visibility, low-encryption outcome (bottom-right). In summary, only two of the four total outcomes were realistically achievable equilibria at Precision, as illustrated by the shaded quadrants in Figure 5F: high visibility, high encryption (top-left) or low visibility, low encryption (bottom-right). While most prior management scholarship (cf. Bechky, 2003; Gibson & Vermeulen, 2003) has assumed that visibility of action and accessibility of knowledge are logically collinear (Private-Transparent diagonal), this result provides evidence that they can be behaviorally orthogonal.

That result has implications for organizational theory, given that much of the existing discourse has focused on the movement from "private" to "transparent" organizations (cf. Best, 2005) on the widely-held belief that "publicly useful information is generally underprovided" (Florini, 2007). At least at Precision, however, efforts to move to high visibility, low encryption, as established management precepts dictate, would result in the original status quo: a highly transparent organizational design with significant encryption in peer communication. Instead, a more valuable question is which of the two off-diagonal cells—privacy by encryption or privacy by visibility—are preferable for organizational learning, productivity, and performance. As demonstrated by this research at Precision, the choice of one type of boundary or another has profound implications for behavior and performance.

For Precision, movement from privacy by encryption to privacy by visibility through visible privacy—via curtains—resulted in valuable behavioral changes that made workers more productive. Although outside the scope of this work, existing literature would suggest that other interventions might have had similar effects, including the degree of workgroup autonomy (Hackman & Oldham, 1975), the presence of self-managed teams (Barker, 1993), or the use of autonomous workgroups (Pasmore, Francis, Haldeman, & Shani, 1982). The links between this research on transparency and related aspects of those theories remain topics for further research. What is important to note here is that the curtain, as a weak, non-invasive intervention, held the above mostly constant: the qualitative data offered no evidence of changes in power, status, authority, or organizational culture as a result of the curtain. In a context in which real-time performance is so closely and transparently monitored by both Precision analysts and customers in real time, the curtain actually offered individual operators very little—only privacy of activity was granted, and a permeable, temporary, and delicate privacy boundary at that. Compared with significantly more invasive interventions such as those above, this intervention reflects a change of minimal cost. But the impact at the group level was substantial: a sustained marginal performance increase as large as 10–15 percent, induced from such a minor privacy intervention, is a testament to the potential value of zones of privacy.

Chapter 6: Seeing Too Much
Too Much In Sight, Too Little Insight?

"Sunlight is said to be the best of disinfectants; electric light the most efficient policeman." (Justice Louis Brandeis)

"Observer Effect" in Physics: Changes that the act of observation will make on a phenomenon being observed. (e.g., Buks, Schuster, Heiblum, Mahalu, & Umansky, 1998)

"Whenever a conflict arises between privacy and accountability, people demand the former for themselves and the latter for everybody else." (Brin, 1999: 12)

Do something that 'looks weird' and be prepared to attract attention. Unexpected activity routinely triggers interest among observers, whether such activity is innovative or imprudent. That is as true at work as it is in public life. A huddle of workers on a factory floor could indicate teamwork or trouble; an urgent meeting of executives called by the CEO might signal crisis or opportunity; unexpected changes to the composition of mortgage products sold to consumers could be consumer-friendly innovation or danger ahead. The only certainty is that each of these 'looks weird' situations, if transparent, will immediately attract the attention of observers—managers, stakeholders, and regulators respectively—in a form of organizational rubbernecking. As managers and human beings, we learn to have our attention captured by anomalies we observe (Bradley, 2008; Duncan, 1984; Pavlov, 1927; Sokolov, 1963). And yet, when we are at risk of being observed, we also learn to keep those anomalies hidden beyond either visible or encryption boundaries or, in the face of uncontrolled exposure, even stop engaging in the production of them at all (Townsend, 2005). That is the formulation for the human desire for privacy.

Drawing upon those three concepts—privacy, transparency, and the attentional effect of looking weird—this chapter aims to make a rather simple yet powerful theoretical contribution to the management and organizations literature: in circumstances under which "looking weird" might be beneficial, the benefits to organizational observability may be limited and greater privacy, designed to strategically channel attention, may be productive. I define productive as performance enhancing, with common components of "productive" work behavior including dialectics of learning and control (Deming, 1986), exploration and exploitation (March, 1991), continuous improvement and repeatable execution (Hackman & Wageman, 1995; Sitkin et al.,

1994), experimentation and standardization (Spear & Bowen, 1999), dynamic capabilities and ordinary capabilities (Winter, 2003), flexibility and efficiency (Adler et al., 1999; Sethi & Sethi, 1990; Thompson, 1967: 15), or collaboration and control (Sundaramurthy & Lewis, 2003). In each pair, the two items indicate different, paradoxical (Lewis, 2000) "models of man" (Davis, Schoorman, & Donaldson, 1997), where the first will benefit from some level of 'looking weird' while the second will not. This chapter argues that the presence or absence of zones of privacy, by allocating selective *attention*, weigh heavily on which productivity component is accentuated at any point in time, thereby impacting productivity.

I support that conclusion by introducing an attention-driven view of organizational productivity, drawing on research on selective attention, privacy, and transparency. I then marry that theory with empirical survey data from the PrecisionMobile field experiment, collected both prior to and after the installation of the curtain, which provides a self-reported view of what it was like to be inside the curtain. I conclude with a theoretical discussion of the interdependent connection between attention, privacy, and performance and its implications for practice.

ATTENTION-DRIVEN VIEW OF ORGANIZATIONAL PRODUCTIVITY

Research on selective attention has existed since the birth of the field of Psychology (James, 1890: XI). James (1890) described attention shifts as being under voluntary or involuntary control. Complemented by Hermann von Helmholtz' earlier identification of covert attention shifts as distinct from overt eye movements (Warren & Warren, 1968)—his attention could shift faster than his eyes could move, the field of selective attention was born.

Visual selective attention operates "at each level of the visual hierarchy to resolve competition between multiple stimuli," enable coherence, and provide focus for higher levels of

human performance (Serences & Yantis, 2006). Selective attention, and particularly the resulting shifts in attention, have therefore been the focus of substantial experimental research (for reviews, see, e.g., Bradley, 2008; Klein, 2009; LaBerge, 1995; Monsell & Driver, 2000; Pashler, 1999; Petersen & Posner, 2012; Posner & Petersen, 1990; Wickens & McCarley, 2007; Wright & Ward, 1994). Such attentional shifts have been grouped roughly into two categories, goal-driven (endogenous, voluntary, intrinsic, top-down, central) or stimulus-driven (exogenous, reflexive, extrinsic, bottom-up, peripheral), depending on whether the shift is initiated through a deliberate push by the mind or in "pull" response to "abrupt-onset stimuli or visual transients somewhere in the visual field" (Klein, 2009; Wright & Ward, 1994: 152; Yantis & Gibson, 1994; Yantis & Jonides, 1984). The former category might be best summarized by the term "executive control" (Klein, 2009) and the latter orienting under "attentional capture" (Petersen & Posner, 2012; Posner & Petersen, 1990; Yantis & Jonides, 1984).

Whether initiated by executive control or attentional capture, such shifts in selective attention can be both costly and beneficial for performance. A spatial shift in attention from one location to another has been shown to require a "disengage-shift-engage" sequence which takes time and requires multiple brain functions (Posner, Petersen, Fox, & Raichle, 1988). That investment in an attentional shift may fail to produce a positive return if one fails to achieve perceptual coherence rapidly or accurately enough to address an immediate need, perhaps due to activation of non-rational yet innate phenomena such as inhibition-to-return (Klein, 2000), attentional blink (Anderson, 2005), misread cues (Fan, McCandliss, Sommer, Raz, & Posner, 2002), or inattentional blindness (Mack & Rock, 1998; Simons & Chabris, 1999). Nonetheless, even long response times are typically measured in the hundreds of milliseconds, and while that may be a meaningful dependent variable for experimental studies on attention, it is unlikely to be

meaningful in most managerial settings. More relevant for an organizational context is the possibility that stimulus-driven, attentional capture shifts have the potential to distract organization members from the best focus of their attention, resulting in lost productivity. That potential cost must be weighed against the possibility that "such distraction can be beneficial in alerting the observer to important changes in the environment that might otherwise have been ignored" (Kelley & Yantis, 2009: 1). Therefore, the key question for the discussion here is not if stimulus-driven shifts in attention are productive, but rather *when* and *how* stimulus-driven shifts can beneficially interrupt executive, top-down attentional control (for related arguments, see Jett & George; 2003 and Staats & Gino, 2012). In an ideal context, productive stimulus-driven attention shifts would be welcomed while unproductive ones would be blocked. In the words of psychology, stimulus-driven shifts must be filtered (Brown & Fera, 1994).

Filtering in the Lab versus Filtering in Organizations

In laboratory experiments on selective attention, that filtering process can only be performed by the subject participant herself, because she is only interfacing with non-human stimuli. It is for that reason that Klein (2009: 250) identified "understanding the convergence of bottom-up and top-down signals in the control of behavior and thought" as "one of the great problems for neuropsychological science," since it is the top-down executive control that would ultimately filter bottom-up, stimulus-driven shifts and prevent unproductive ones from occurring. That process of self-regulation (Petersen & Posner, 2012) has been shown to be trainable through a diverse set of methods, including both repetitive practice and meditation (Tang & Posner, 2009). Practice itself can take on two forms: experience focusing on a particular spatial channel or "beam" of attention (James, 1890; Posner, Snyder, & Davidson, 1980), which results in rapid processing of whatever signal subsequently occupies that space with less chance for attentional

capture by activity elsewhere on the landscape (Yantis & Jonides, 1984: 602), or repeated experience with a particular visual display, which results in less novelty and therefore less attentional capture (Yantis & Jonides, 1996). In essence, as demonstrated in laboratory experiments, one learns to self-regulate by either narrowing visual inputs or reducing curiosity.

In real organizations, unlike the laboratory, selective attention stimuli are often human. On the one hand, that complicates training, as neither narrowing the field of view (since human beings can, and often do, cross right into it) nor repetitive exposure (since novel activity can take an almost infinite number of forms) work quite as well. On the other hand, having human alters adds an entirely new mechanism for filtering: regulation by alters in place of, or in addition to, self-regulation by ego. Rather than ego needing to control the degree to which her attention is captured by alters' behavior, alters can instead hide the stimuli from ego's field of view until the time at which attention by ego would be valuable for one or both parties.

If alters act in the interests of organizational performance, such alter-based regulation of attention would have a significant advantage over ego self-regulation: despite being trainable, scholars have also found that self-regulation of curiosity is hard or even futile (Carver & Scheier, 2001; Litman, 2005; Loewenstein, 1994). Curiosity is one of our oldest and most powerful temptations (Baumeister, Heatherton, & Tice, 1994; Westin, 1967: 19), as exemplified by tales of Pandora's Box, Eve tasting the apple, Lot's wife, Bluebeard's wives opening the forbidden room, Psyche almost losing Cupid, etc. (Westin, 1967: 20).

While human beings likely spend symmetrical amounts of time observing others and being observed, their natural capacity to regulate attention is asymmetrical: human beings are far more capable of hiding weird-looking activity from the attention of others than those others are at

preventing those weird-looking activities from catching their attention. It is easier to manage others' temptations than our own. For humankind, this is a feature, not a bug. The foundations of attention are believed to stem from "activation of defensive and appetitive motivational systems that evolved to protect and sustain the life of the individual" (Bradley, 2008: 1)—through years of evolution, human beings have survived in part because of their sense of curiosity and instinctual response to it (Lawrence & Nohria, 2002: 107–110). But survival instincts from the bush may not translate into effective management.

On the contrary, having management's attention constantly captured by anything weird-looking within their gaze can lead to unproductive interventions and interruptions at inopportune times, be seen by others as micromanagement, and have a chilling effect on experimentation or learning relative to control. The work of organizations is necessarily subject to information equivocality (Weick, 1979: 3), where information cues are often ambiguous, not just externally but also internally. An organization must interpret ambiguous stimuli and reduce them to sufficient clarity for action within the organization. People act on scraps of information and form these scraps into coherent wholes (Daft & Weick, 1984). "Multiple cues can distract the receiver's attention from the routine message" (Daft & Griffin, 1986: 13) and ultimately stand in the way of productive behavior as easily as they can expose unproductive behavior.

More transparency makes this outcome worse, not better. If transparency yields a much greater field of view, the cognitive capacity to process that view remains static therefore subject to information overload (Galbraith, 1974; O'Reilly, 1980; Schneider, 1987; Schneider & Angelmar, 1993; Speier, Valacich, & Vessey, 1999; Tushman & Nadler, 1978), and self-regulation of attention by the observer is not perfectly rational, the result of transparency can take organizations a step beyond adhocracy (Mintzberg & McHugh, 1985) and haphazard

distraction (e.g., Kotter, 1999) to inefficient, unproductive management. Rather than managing a forest, transparency provides the detailed stimuli to encourage selective managerial attention on each weird looking tree in sight.

Organizational Performance: A Question of Attention?

Over the past few decades, psychology and neuroscience research on attention has skyrocketed, increasing by 400% relative to other categories of cognitive publications (Cavanagh, 1998). And yet, "after many thousands of experiments, we know only marginally more about attention than about the interior of a black hole" (Sutherland, 1998). Bridging more of the insights from selective attention research into organization theory and design may be mutually beneficial for both literatures.

An analogous, related effort in strategy provides encouraging results. One of the powerful concepts to emerge from the 1990s strategy literature was the attention-based view of the firm: that strategy "is the result of how firms channel and distribute the attention of their decision-makers" (Ocasio, 1997: 187). In essence, that which determines decision-makers' attentional focus also defines, at least in part, the strategy of the firm and firm-level decision behavior. Attention structures (March & Olsen, 1976) and context "govern the allocation of time, effort, and attentional focus of organizational decision-makers in their decision-making activities" (Ocasio, 1997: 195) and therefore the strategic direction of the organization. More recent research on the attention-based view of the firm includes communication structures and situated task structure among the ingredients of that which determines the attentional structure of the firm (Gebauer, 2009; Ocasio, 2012) and therefore strategic decisionmaking, priorities, and choices.

Nonetheless, the impact of attentional structures on productivity, especially at lower levels of the firm, and the impact of greater *transparency* on those attentional structures, remains unexplored. If one accepts the proposition by Simon (1947) that decision-makers are limited in the number of issues on which they can focus and to which they can attend, being exposed to more activities which 'look weird' will trigger curiosity and automatically redirect attention (see also Dunbar, 1992). That may not just be true of decision-makers, but also of individuals throughout the firm, from supervisors to peers to reports, with productivity implications. If you want to trigger a desire in someone to read something, title it, "Don't Read This, It's Private" (Kanter, 2009). If you want to be left alone, then avoid the appearance of looking weird to others.

PrecisionMobile provides vivid examples of the importance of this connection between transparency, looking weird, and attention in how work was accomplished. Prior to installation of the curtains, there were no walls, doors, or other barriers to visibility: the factory floor was completely transparent. Resources were drawn to anything that looked weird—as in many organizations, it was the "pull" trigger for the allocation of flexible resources including attention. Factory workers knew, from their own experience and the experience of others, that looking weird would trigger that attention. That could be expensive. While intervention could be valuable in some circumstances, it could disrupt productive work in others—for the observed (e.g., "an embryonic procedure not yet ready for the light," Dalton, 1959: 231), the observer (e.g., what I call organizational rubbernecking), or both. In such circumstances, individuals may self-regulate (Dalton, 1959; Margulis, 2003): when an individual believes attention invested in her will yield return, she seeks attention by allowing her 'looking weird' behavior to be seen; conversely, when she believes that attention is not deserved or might even be counterproductive,

she hides behind a cloak of looking normal to achieve, in the workers' words, the "privacy we need to get our work done."

How and why did this aspect of behavior change on the line when the curtain was installed? Such a question around precise mechanisms is open to a wide array of hypotheses and theories. Survey data collected at PrecisionMobile, both prior to and after the installation of the curtains, can help to answer that question by providing a self-reported view of what it was like to be inside the curtain and how the installation of the curtain affected the regulation of attention on the factory floor. From prior chapters, we know that privacy can make us productive. In the following sections, through an investigation of the role of attention, we turn to the question of how.

SURVEY METHODS

Survey data consisted of two types: (1) a sociometric survey of communication on the factory floor immediately after the initial participant-observation study (prior to the field experiment); and (2) a longitudinal survey of all 32 lines involved in the field experiment, conducted once two weeks prior to the curtain installation and again four weeks after it was installed.

Longitudinal Survey Methods and Descriptive Statistics

589 surveys were completed by operators on the factory floor, consisting of 332 responses pre-experiment (pre-curtain) and 257 responses during the experiment, approximately a month after the curtain was installed. Given the roughly 640 operators on the floor, that represented a response rate of roughly 52% and 40% respectively. In total, 480 responses (81%) came from control lines and 109 responses (19%) came from curtained lines. Given that four out of 32 lines (12.5%) were curtained, the experimental line response rate was slightly higher than the control

line response rate. For reference, Appendix 6A presents the actual survey distributed and an English translation.

Respondents had an average tenure of 14 months at PrecisionMobile (Table 6A). When asked how long they plan to stay, the largest group (40%) indicated plans to stay for 2-3 years, 24% planned to stay 1-2 years, and the remaining third was distributed as shown in Table 6A. Based on other research focused on Chinese migrant worker populations at this time (e.g., Chang, 2009), both tenure and planned tenure were roughly indicative of the average or slightly above.

Table 6A: Tenure and Planned Tenure

	% of Respondents with Current Tenure	% of Respondents who Intend to Stay for this Tenure
< 6 Months	**27%**	**4%**
6-12 Months	**16%**	**8%**
1-2 Years	**42%**	**24%**
2-3 Years	**11%**	**40%**
3-5 Years	**3%**	**13%**
5+ Years	**1%**	**11%**

For practical reasons, because this survey was distributed to factory floor workers, it had to be in paper form and it had to be a single sheet (front and back). We were therefore considered very carefully which instruments to include. As discussed in Chapter 4, in preparation for the field experiment, I had created a number of potential interventions to moderate the need for privacy on the factory floor. Those potential interventions ended up being the source for the survey instruments: team psychological safety (Edmondson, 1999), communication (e.g., Cross & Parker, 2004; Monge & Contractor, 2003, 2001; Scott, 1991), resources/capabilities (e.g., Bower & Gilbert, 2005; Christensen & Kaufman, 2008; Peteraf, 1993; Wernerfelt, 1984), and motivation (e.g., Alderfer, 1972; Herzberg, 1968; Herzberg, Mausner, & Snyderman, 1993; Lawler, 1973; Maslow, 1943; Vroom, 1964).

For each instrument, a difference-in-differences estimation model is used to analyze the results of the longitudinal survey data, consistent with the model used to analyze the performance data in Chapter 5. Difference-in-differences estimation permits a precise yet simple analysis (Bertrand et al., 2004) of the significance of the curtain intervention on the treatment group relative to any changes in that instrument experienced by the unaffected (uncurtained) groups. The basic estimation model remains the same as before:

$$Y = \beta_0 + \beta_1 * dExp + \beta_2 * dTime + \beta_3 * dTime * dExp + \varepsilon \qquad (1)$$

where Y is the survey result of interest, dExp is a dummy variable expressing whether a line is an experimental (1) or control (0) line, dTime is a dummy variable expressing whether the time is before (0) or after (1) the intervention, and dTime*dExp is the interaction of the two (Figure 2). When Y involved a Likert (5-point or 7-point) scale, I used an ordered probit estimation of the difference-in-differences model. When Y involved a binomial scale (0 or 1), I used a simple probit estimation. When Y involved a continuous dependent variable, I used ordinary least squares. Finally, a few survey questions emerged from the inductive process of observing the experiment. Since those questions did not have longitudinal data, a difference-in-differences estimation was not possible, and standard OLS, probit, or ordered probit was used.

Sociometric Survey Methods and Descriptive Statistics

As a preliminary step, significantly prior to the field experiment, a standard sociometric network survey (see, e.g., Cross & Parker, 2004) was conducted. All "direct" labor (operators) from two, end-to-end assembly lines were asked to complete a paper survey including the question: "Please identify up to twenty people who are important in terms of providing you with information to do your work or helping you think about complex problems posed by your work.

These may or may not be people you communicate with on a regular basis and can come from within Precision or outside (e.g., customers, suppliers, family, etc.). Recent interactions should help you choose. You do not need to identify as many as 20 individuals--only as many as you feel are relevant." In addition to identifying the alter's name, they were also asked to answer questions about the tie, including physical proximity (e.g., same floor, different floor but same building, etc.), primary form of communication (e.g., e-mail, phone, face-to-face, etc.), length of acquaintance (e.g., less than 6 months, 6-12 months, etc.), relative hierarchy (e.g., senior, same, junior), frequency of interaction (e.g., times per day, week, or month), purpose (e.g., information gathering, problem-solving, cooperation), initiation (e.g., ego, alter, or mutual), and value of the interaction (e.g., agree or disagree that more interaction with yield greater work effectiveness). A similar survey was then administered, via an intranet-based online survey, to all of the non-operator "indirect" labor (engineers, supervisors, managers, etc.) who were responsible for each of those two lines. On both surveys, the combination of both English and Chinese names, along with the tie-based data referenced above, enabled a higher likelihood of accurately matching individuals across responses. The survey had a response rate of 98% (n=172) for the operators and 82% (n=678) for the indirect labor.

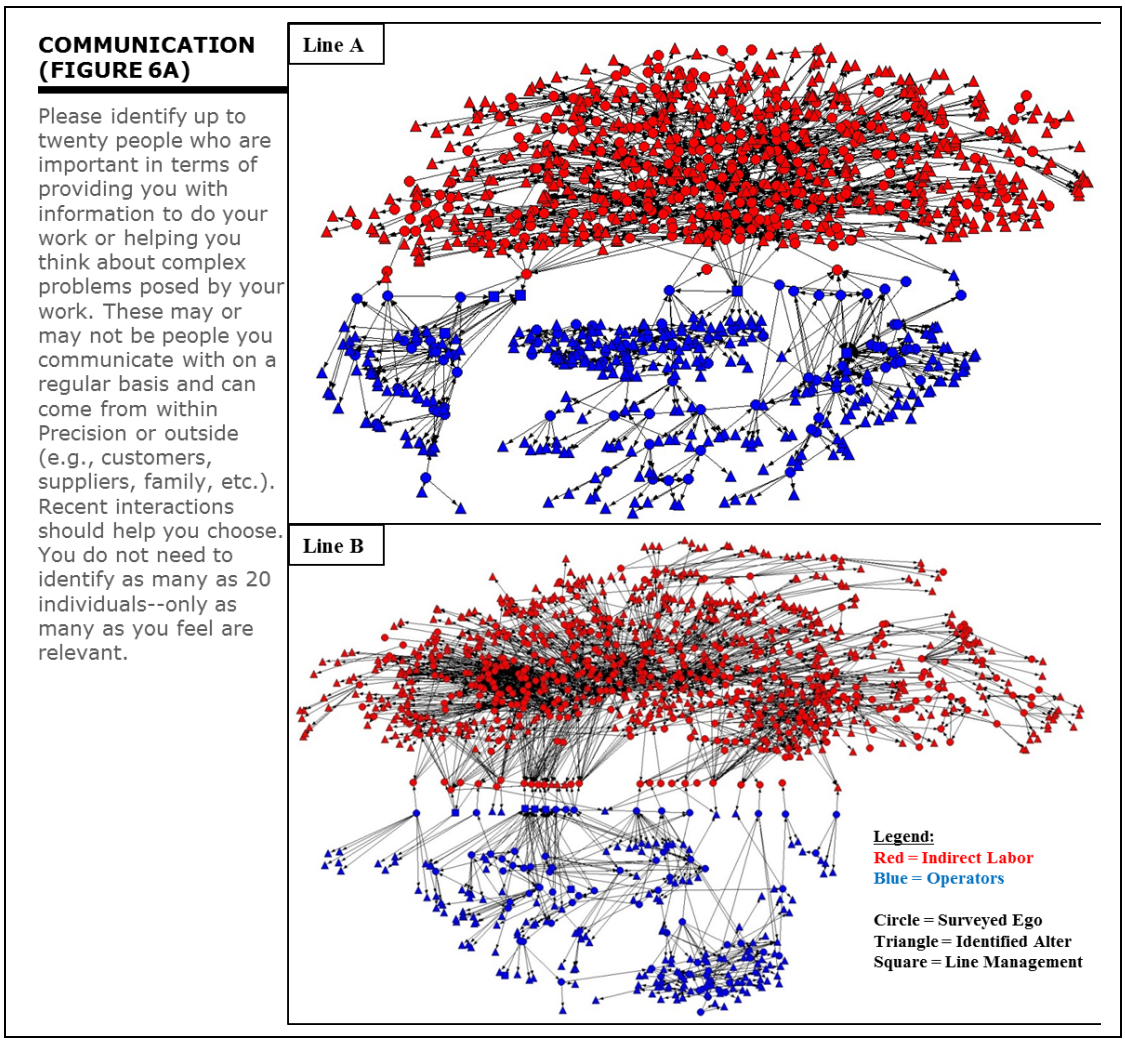
SURVEY RESULTS

Communication

Attentional structures and communication structures have obvious dependencies. There are two baselines for communication prior to the installation of the curtain. From a standpoint of observability, the factory floor was nearly 100% 'connected'—it had been set up purposefully to allow for clear line-of-sight observation by anyone of anyone. From a standpoint of usefulness, the sociometric survey provides a baseline of which communication ties individuals self-

identified as important. Those baselines then provide an interesting background for the self-reported changes in communication which resulted from the curtain.

Sociometric (Pre-Curtain). The sociometric survey of Line A resulted in 1131 nodes with 1859 ties. The survey of Line B resulted in 1211 nodes with 2422 ties. The diagrams in Figure 6A are representations of the two self-reported sociometric networks. In each case, the layout was automatically calculated based on Netdraw's standard algorithm ("layout with node repulsion and equal edge length bias") (Borgatti, 2002). The diagrams were then rotated so that their orientations matched (i.e., non-operator nodes on top and operator nodes on the bottom), and the two clusters were slightly separated to show the bridging nodes most clearly.



Overall, only 1.45% of the ties on Line A and 1.36% of the ties on Line B identified interactions between operator and non-operator nodes. When asked with whom individuals communicated to get their work done, the answer rarely included anyone who was not proximate in geographic, hierarchical, or functional distance. There were particularly few "pull" connections between direct and indirect labor. In a different manifestation of a similar phenomenon, suggestion boxes were prevalent but empty across the factory floor. In the pre-curtain phase, communication—and attention—was significantly localized despite a highly transparent environment where everything could be seen by everyone, a result highly consistent with the qualitative participant observation data detailing ways in which attention was self-regulated via hiding behavior.

How might the curtain change this situation? One could, for example, expect the curtain to worsen an already unproductive situation. Broad communication of local knowledge is essential for intraorganizational learning (e.g., Argote & Ophir, 2002; Epple, Argote, & Devadas, 1991), especially in environments where the same activity is being executed in multiple groups (Adler & Clark, 1991). While initial learning may be "local, interpersonal, and variegated" (Edmondson, 2002), organizational learning benefits from the sharing of results from that local learning. For an organization like PrecisionMobile, where competitive advantage is based on limitless scale and repeatable execution across, for example, 32 identical lines, communication of knowledge would seem to be essential for performance. It is the quintessential environment where, according to the literature, communication should be valued. And yet these individuals, both direct and indirect labor, did not identify non-proximate others as being "important" for providing information. Rather than installing a curtain, the traditional response would be to install some spotlights.

Longitudinal Communication Data. To understand these dynamics better, I asked operators (i.e., direct labor), both before and after the installation of the curtain: "when you are communicating with others to improve performance or solve problems, what percentage of your communications are with" other operators, line management, engineers, or others? Table 6B details the results. The first and third colums from the left confirm a similar bias towards

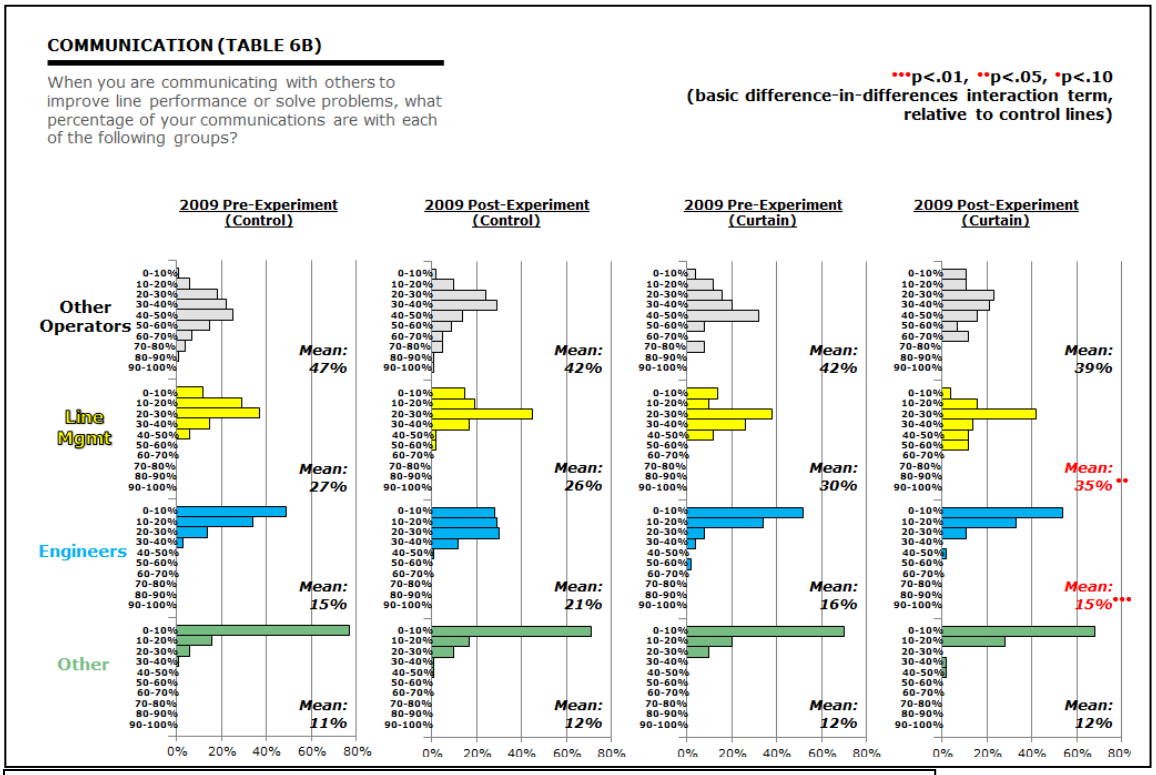


Table 6C. Difference-in-Differences GLS Model of Communication

Q: "When you are communicating with others to improve performance or solve problems, what percentage of your communications are with…"

	Communication with other operators	Communication with line leaders	Communication with engineers	Communication with others
Variable	**(1)**	**(2)**	**(3)**	**(4)**
dExperiment	-0.46	0.03	0.00	0.01
	(0.03)	(0.02)	(0.02)	(0.01)
dTime	-0.05**	-0.01	0.06***	0.00
	(0.02)	(0.10)	(0.01)	(0.01)
dExperiment * dTime	0.02	0.06***	-0.07***	-0.01
	(0.04)	(0.03)	(0.21)	(0.02)
Constant	0.47***	0.27***	0.15***	0.11
	(0.01)	(0.01)	(0.01)	(0.00)
R-squared	0.03	0.05	0.07	0.00
Observations	560	560	560	560

* $p < .10$; ** $p < .05$; *** $p < .01$.

* Models are GLS fixed-effects models with heteroskedasticity-robust standard errors in parentheses.

seeking information from proximate sources, with roughly 70% of the knowledge transfer being done with other operators or line leaders. At most about a quarter of communication is with Engineers or other functional support (e.g., kaizen groups, small group activity groups, etc.). That is still more than the network diagram from the original sociometric survey would suggest, but it is less than one might expect given an effort to "improve line performance" or "solve problems." The second and fourth columns show the change after the curtain had been in place for about a month. As shown in Table 6C, based on the difference-in-differences interaction term, there is a significant difference between the amount of communication with the line leaders and the engineers in the treatment versus control conditions. With the curtain in place, workers were relatively more likely to communicate with line leaders, and less likely to communicate with engineers, in order to improve line performance and solve problems. In an almost Barnardian fasion (Barnard, 1938), the curtain had the impact of focusing attention, and communication, within the boundary created by the curtain.

Why was that productivity-enhancing? According to the operators within the curtain, communication with line leaders was far more "enabling" than communication with engineers and individuals in other functional roles (Table 6D). As part of the final survey, I asked workers what percentage of their communication with each group was enabling versus constraining (see, e.g., Adler & Borys, 1996). Because this question was only included in the final survey, a difference-in-differences approach was not possible, but a direct comparison across control and experiment treatments is. Table 6E shows significance in an OLS estimation model. It is particularly notable how different the perception of engineers and others was with the curtain was in place. Communication with engineers and others became much more constraining, at least based on the self-reporting by the operators, for operators on the curtained lines.

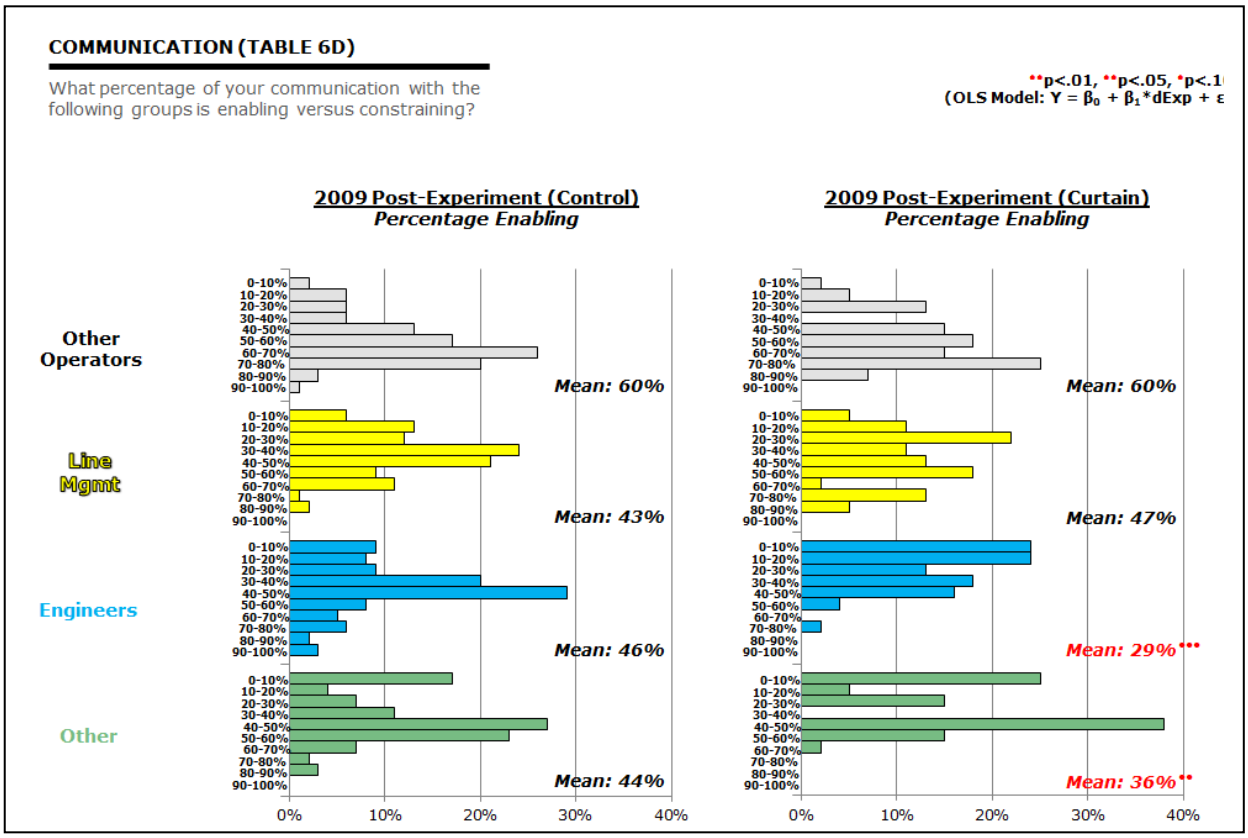


Table 6E. Difference-in-Differences GLS Model of Communication

Q: "When you are communicating with others to improve performance or solve problems, what percentage of your communications are with…"

Variable	Communication with other operators (1)	Communication with line leaders (2)	Communication with engineers (3)	Communication with others (4)
dExperiment	-0.00	0.04	-0.17***	-0.08**
	(0.03)	(0.03)	(0.03)	(0.03)
Constant	0.60***	0.43***	0.46***	0.44***
	(0.01)	(0.01)	(0.02)	(0.02)
R-squared	0.00	0.01	0.10	0.02
Observations	235	235	235	235

*$p < .10$; **$p < .05$; ***$p < .01$.

* Models are ordered probit fixed-effects models with heteroskedasticity-robust standard errors in

Similar results were found when the operators were asked about how helpful six categories of individuals—other operators, line management, engineers, lean teams, kaizen teams, and small group activities (SGA) teams—were when trying to "experiment" or "innovate" on the line.

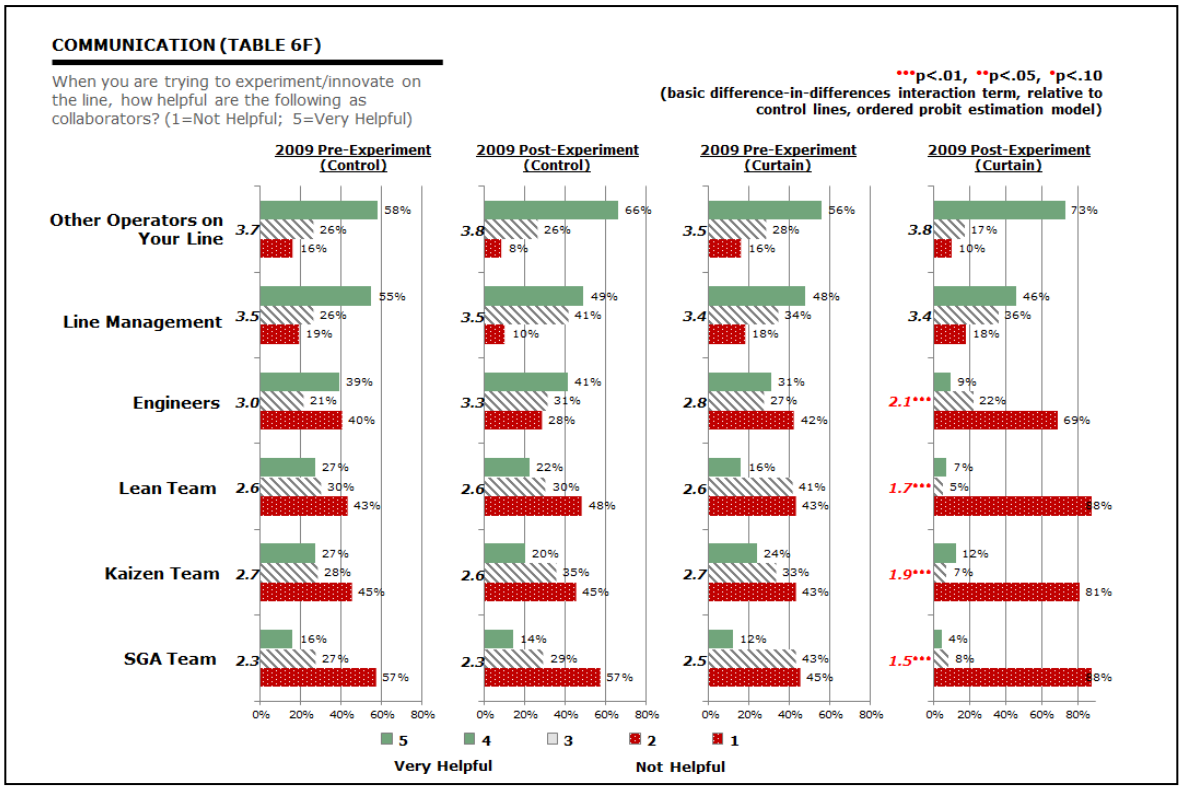


Table 6F presents descriptive statistics on responses by operators, both on the control and experimental lines, before and after the curtain was installed. As opposed to Table 6D and 6E, because this data was longitudinal (before and during the curtain), this data suggests that perceptions actually changed as a result of the curtain, as demonstrated by the difference-in-differences interaction terms from the model estimations in Table 6G. The curtain significantly lowered the perception of collaborator helpfulness of engineers, lean teams, kaizen teams, and SGA teams relative to the control lines.

Table 6G. Difference-in-Differences Ordered Probit Model of Helpful Communication/Collaboration
Q: "When you are trying to experiment/innovate on the line, how helpful are the following as collaborators?"

	Other operators on your line	Line management	Engineers	Lean Team	Kaizen Team	Small Group Activity (SGA) Team
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
dExperiment	0.11	-0.12	-0.19	-0.03	-0.01	0.17
	(0.10)	(0.17)	(0.16)	(0.15)	(0.16)	(0.15)
dTime	-0.21	-0.10	0.22¨	-0.04	-0.06	0.05
	(0.01)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
dExperiment * dTime	0.22	0.01	-0.78‴	-0.78‴	-0.68‴	-1.14‴
	(0.21)	(0.22)	(0.22)	(0.23)	(0.24)	(0.24)
Observations	564	563	548	547	554	556

˙$p < .10$; ¨$p < .05$; ‴$p < .01$.
* Models are ordered probit models with heteroskedasticity-robust standard errors in parentheses.

Understanding these communication and collaboration results is complicated by the potential for two quite different interpretations. The simplest interpretation is that the curtain made the engineers, lean teams, kaizen teams, and SGA teams less effective because they had less access to the line. Unfortunately, that interpretation is inconsistent with both the embeds' observations that those individuals came to the line at least as much as before and the fact that performance improved with the curtain in place. A somewhat more consistent interpretation, supported by the qualitative and performance data, is that the curtain made the constraining nature of communication with engineers, lean teams, kaizen teams, and SGA teams more salient and, ironically, observable—both to the operators and, via their increased willingness to self-report on it, to us. That salience may have been accentuated by two themes which emerged during the exit interviews: the strengthening of an in-group / out-group phenomenon (Cooley, 1909) enabled by the curtain; and the operators' observation that alters similarly situated on the line were more helpful collaborators (Bechky, 2003). Among other comments, operators from the curtained lines observed that "it's hard to ask engineers for help" and that they "think [engineers] don't do their

work carefully, just the minimum to get by every day." One operator from a control line commented that they find anyone other than the other operators and line leaders less helpful because it is harder to "get their attention" when, and only when, they need it. Another said "it can be difficult to communicate with the management—sometimes all we do is to take orders."

Because the curtain was installed around the line, it had the effect of focusing their attention around the unit that operators found most helpful, collaborative, and enabling, while simultaneously reducing the chances that activity would catch the attention of those whom the operators found less useful or even, perhaps, counterproductive. Patterns of communication, and the characteristics of that communication, followed suit. In the operator's own words, "privacy helps us to save time from unnecessary, no-value-add communications with them."

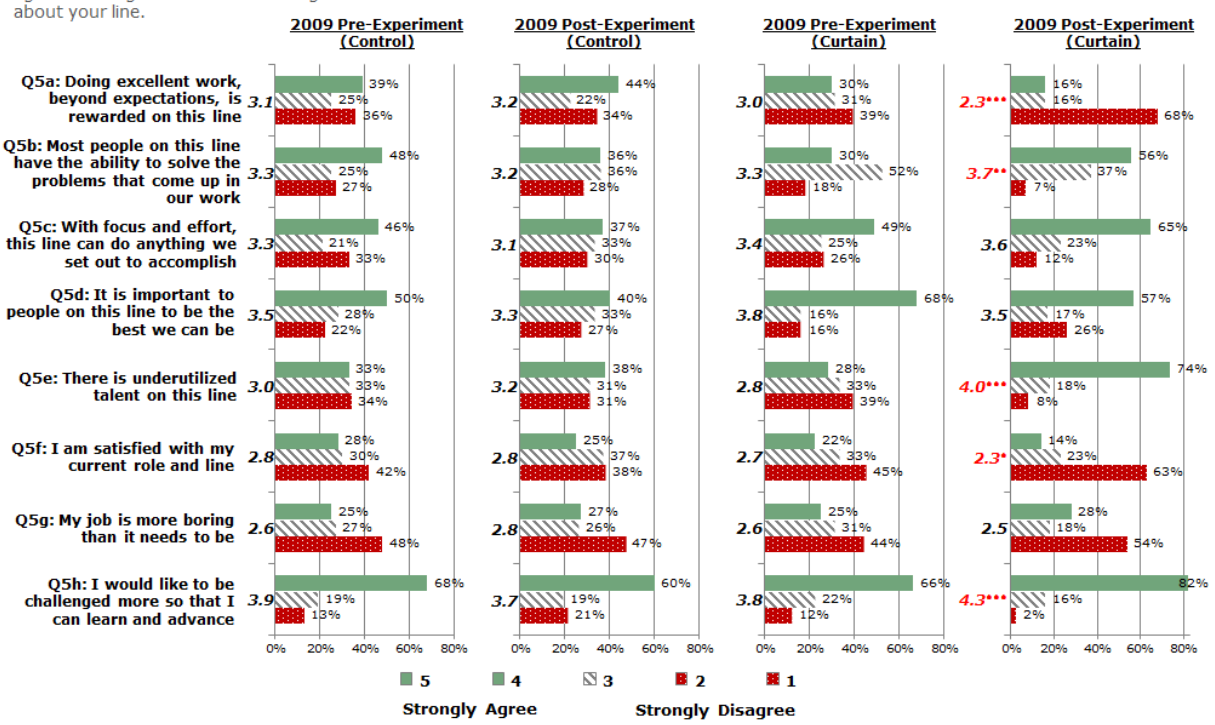
Resources and Capabilities

As changes in communication and collaboration networks can impact productivity, so can changes in capabilities or access to other resources. The installation of privacy boundaries, and the resulting refocusing of attention, may impact access to both capabilities and resources. To see if, and how, changes in capabilities or resources resulting from the curtain might explain some of the performance improvement on the curtained lines, I included a number of self-assessment questions on both line capability and potential resources for improvement. The questions, and descriptions of the results, are captured in Tables 6H and 6J. Tables 6I and 6K capture the difference-in-differences model estimations for each of the various questions.

SELF-ASSESSMENT OF LINE CAPABILITY (TABLE 6H)

On a scale of 1-5 (1=Strongly Disagree, 5=Strongly Agree), please state how much you agree or disagree with the following statements about your line.

***p<.01, **p<.05, *p<.10
(basic difference-in-differences interaction term, relative to control lines, ordered probit estimation model)



RESOURCES FOR IMPROVEMENT (TABLE 6J)

Operators on this line could dramatically improve performance if we had (1=strongly agree, 5=strongly disagree):

***p<.01, **p<.05, *p<.10
(basic difference-in-differences interaction term, relative to control lines, ordered probit estimation model)

Table 6I. Difference-in-Differences Ordered Probit Model of Self-Assessed Line Capability

Q: "On a scale of 1-5 (1=Strongly Disagree, 5=Strongly Agree), please state how much you agree or disagree with the following statements about your line."

	Q5a: Doing excellent work, beyond expectations, is rewarded on this line	Q5b: Most people on this line have the ability to solve the problems that come up in our work	Q5c: With focus and effort, this line can do anything we set out to accomplish	Q5d: It is important to people on this line to be the best we can be	Q5e: There is underutilized talent on this line	Q5f: I am satisfied with my current role and line	Q5g: My job is more boring than it needs to be	Q5h: I would like to be challenged more so that I can learn and advance
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
dExperiment	-0.05	-0.01	0.09	0.29	-0.12	-0.07	0.05	-0.13
	(0.14)	(0.13)	(0.14)	(0.15)	(0.15)	(0.16)	(0.14)	(0.15)
dTime	0.03	-0.09	-0.14	-0.13	0.18	0.01	0.18	-0.23**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
dExperiment * dTime	-0.60***	0.41**	0.25	-0.12	0.75***	-0.40*	-0.34	0.63***
	(0.21)	(0.19)	(0.19)	(0.21)	(0.22)	(0.22)	(0.22)	(0.21)
Observations	574	575	565	565	571	571	567	572

*$p < .10$; **$p < .05$; ***$p < .01$.

* Models are ordered probit models with heteroskedasticity-robust standard errors in parentheses.

Table 6K. Difference-in-Differences Ordered Probit Model of Self-Assessed Resources for Improvement

Q: "Operators on this line could dramatically improve performance if we had (1=strongly agree, 5=strongly disagree):"

	Access to More Information	Access to More Resources	More Freedom to Experiment on the Line	Access to More Expert Assistance	More Training	More Feedback on Line Performance	More Information About Line Objectives
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
dExperiment	-0.28	-0.37**	-0.46**	-0.22	-0.26	-0.03	-0.10
	(0.17)	(0.19)	(0.18)	(0.17)	(0.16)	(0.17)	(0.17)
dTime	-0.11	-0.09	0.03	-0.01	0.15	0.16	0.09
	(0.11)	(0.11)	(0.12)	(0.12)	(0.12)	(0.11)	(0.11)
dExperiment * dTime	0.06	1.19***	0.65***	0.09	-0.11	0.04	-0.06
	(0.23)	(0.28)	(0.24)	(0.23)	(0.22)	(0.24)	(0.23)
Observations	498	497	492	494	495	492	495

*$p < .10$; **$p < .05$; ***$p < .01$.

* Models are ordered probit models with heteroskedasticity-robust standard errors in parentheses. Models 8 and 9 are not difference-in-differences because data was not collected on the baseline surveys for those two variables.

The difference between control and experimental perceptions of line capability offer a few interesting clues for the source of performance improvement on the curtained lines. With the installation of the curtain, there was a surge in the perceived levels of underutilized talent on the line which was significantly different from the control lines' longitudinal trend. That was matched with an increase in the perception of line-level abilities to solve problems locally, a desire for more challenge, lower satisfaction with the status quo, and substantially lower perceived rewards for doing excellent work beyond expectations. Those outcomes are all consistent with an increase in confidence on the curtained lines, which has been shown to contribute positively to performance (e.g., Kanter, 2006).

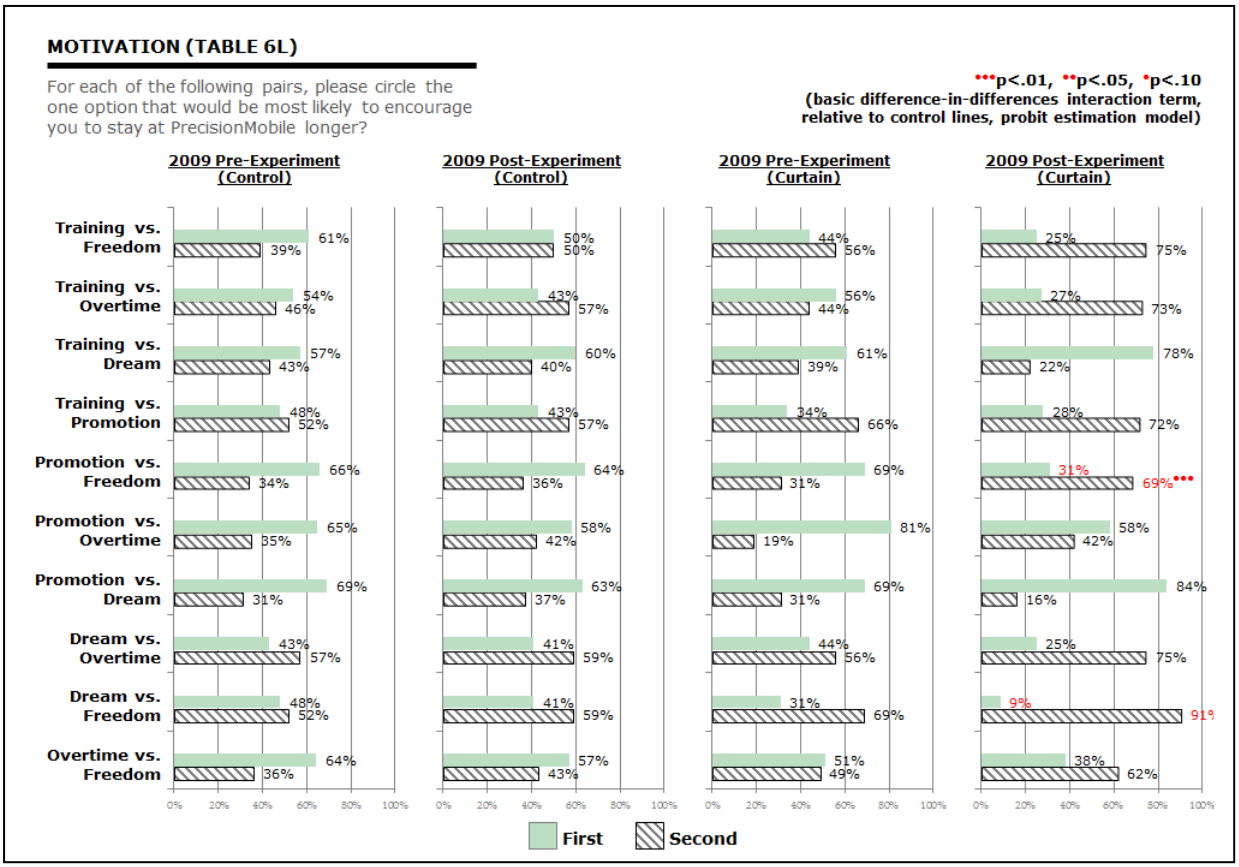
The privacy boundaries, by focusing line attention within the line and providing a barrier against disruptive attention from elsewhere, grew operator confidence and therefore performance on the line. As a supporter on one of the curtained lines put it repeatedly, "I have confidence in all of these people to do it," where "it" referred to almost anything associated with localized production needs. An embed, however, observed that without privacy, confidence was far more difficult to generate: "it takes time for operators to develop confidence, and even then, their confidence may not be strong enough to enable them to be persistent in their pursuit of improvements if they draw negative attention in the interim."

That relationship between privacy, attention, and confidence was reinforced by responses to the survey questions about resources for improvement. The installation of the curtain appears to have increased those operators' confidence, relative to their peers on the control lines, in their ability to deliver dramatically better performance with access to more resources and more freedom to experiment on the line. More so than training, expertise, information, or feedback,

those within the curtain had increased confidence in their ability to deliver with additional resources and being left alone to do their job.

Motivation

To investigate whether the installation of the privacy curtain impacted individual motivation and taste, I included a standard pairwise motivation instrument in the survey. Operators, both before and during the curtain, answered ten pairwise questions to establish a hierarchy of five motivational elements: (1) Higher pay / more overtime pay; (2) Faster promotion / more promotion activities; (3) More training opportunities (e.g., English, computer, management); (4) More freedom / more free time; and (5) Assistance to realize your dream. Results are shown in Table 6L.



Across the board, operators on the curtained lines expressed heightened desire for freedom relative to the other motivators, and the difference-in-differences was significant in the pairwise comparisons of freedom relative to dream assistance or promotion. Privacy, and the albeit limited additional freedom operators felt as a result, appears to have been an acquired taste: once they had a little of it, they wanted more. Otherwise, the curtain appears to have had no significant impact on these standard motivators.

Privacy

In the final survey, after privacy had been established as an important phenomenon, I asked a few additional questions directed purely at privacy, as captured in Table 6M below. Because there is no longitudinal data for these questions, a basic ordered probit estimation model is used, and significance refers to a difference between control and curtained lines (Table 6N).

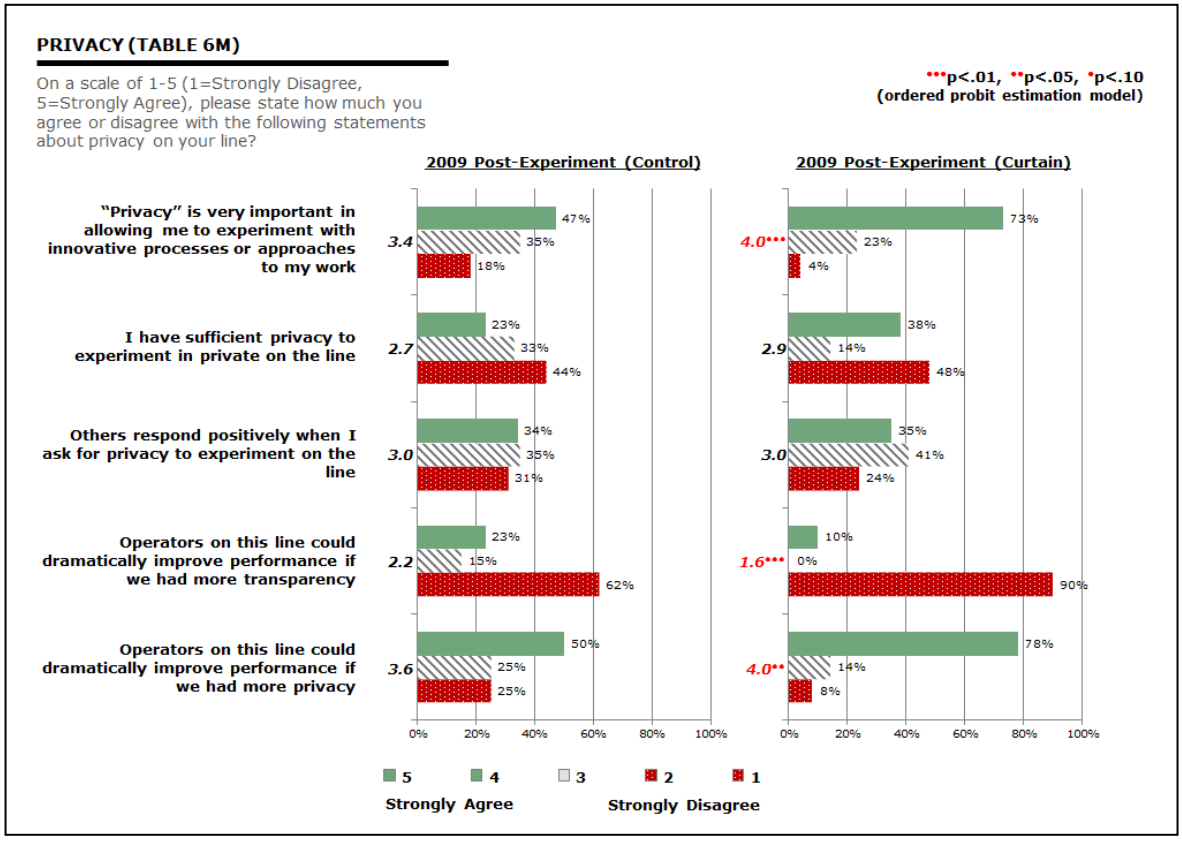


Table 6N. Privacy Questions Post-Curtain (OLS Model)

Q: "On a scale of 1-5 (1=Strongly Disagree, 5=Strongly Agree), please state how much you agree or disagree with the following statements about privacy on your line?"

	"Privacy" is very important in allowing me to experiment with innovative processes or approaches to my work	I have sufficient privacy to experiment in private on the line	Others respond positively when I ask for privacy to experiment on the line	Operators on this line could dramatically improve performance if we had more transparency	Operators on this line could dramatically improve performance if we had more privacy
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
dExperiment	0.61‴	0.25	-0.05	-0.71‴	0.45‥
	(0.17)	(0.18)	(0.17)	(0.22)	(0.21)
Constant	3.43‴	2.67‴	3.05‴	2.29‴	3.57‴
	(0.08)	(0.09)	(0.08)	(0.11)	(0.11)
R-squared	0.05	0.01	0.00	0.05	0.02
Observations	237	237	237	199	200

˙$p < .10$; ‥$p < .05$; ‴$p < .01$.

* Models are OLS. (Ordered probit models produce similar results.)

These results reinforce the conception of privacy as an acquired taste. Privacy became perceived as important to the experimental lines in a way that it did not on the control lines (see (1) and (4)). At the same time, transparency became far less welcome on the experimental lines relative to the control lines (5). It is as if individuals woke up to a new important dimension of work—privacy. Interestingly enough, perspectives on the sufficiency of privacy did not change as privacy was implemented: on average, those inside the curtain felt their level of privacy was just as insufficient as those on the control lines (2), although there was some increase in those who found it more sufficient (38% versus 22%). Nor, for that matter, did perceived responses to privacy by others seem to be affected by the installation of the curtain (3). Put differently, ego did not perceive changes in the behavior or receptivity of alter—only a change in the attention that was directed onto ego by alter by virtue of the curtain being in place.

Team Psychological Safety

Prior research suggests that improvements in team psychological safety, defined as how easily members of a team can "ask questions, seek help, and tolerate mistakes in the face of uncertainty—while team members and other colleagues watch," positively impacts team learning behavior and therefore team performance (Edmondson, 1999). Edmondson's reference to the importance of a context in which "other colleagues watch" suggests that the experimental manipulation, the curtain, may have triggered a change in team psychological safety, thereby resulting in a predictable improvement to performance Edmondson (1999) anticipated and putting into question the attention hypothesis presented here.

Using Edmondson's (1999) instrument, however, levels of team psychological safety were not significantly affected by the curtain intervention (Table 6O). Operators were surveyed on the team psychological safety instrument with relation to three different classes of individuals: other operators on the line, line leaders, and engineers. The difference-in-differences interaction term remained non-significant in relation to all three constituencies. The performance improvement was not driven by team psychological safety—privacy, and its impact on attention, is separate and distinct from team psychological safety. That result does not, however, preclude the possibility of an

Table 6O. Difference-in-Differences Ordered Probit Model of Team Psychological Safety

	Team psychological safety towards other operators	Team psychological safety towards line leaders	Team psychological safety towards engineers
Variable	**(1)**	**(2)**	**(3)**
dExperiment	0.59	-0.01	-0.23
	(0.32)	(0.43)	(0.47)
dTime	0.05	-0.09	-0.32¨
	(0.13)	(0.12)	(0.12)
dExperiment * dTime	0.29	0.01	-0.02
	(0.24)	(0.23)	(0.26)
Observations	504	498	493

˙ $p < .10$; ¨ $p < .05$; ⃛ $p < .01$.
* Models are ordered probit models with heteroskedasticity-robust standard errors in parentheses.

interaction between team psychological safety and privacy. The question of whether, and how, team psychological safety and privacy may interact remains an open question for future research.

DISCUSSION: NEGOTIATING ATTENTION

The Watched Pot Never Boils

The late physicist Richard Feynman once observed that the human eye is not really a collector of information, but rather a filter of it. The cues we give to those observing us will determine whether their attention is focused onto us. The cues we receive from those whom we observe will determine whether our attention is focused onto them. In either case, the redirection of attention can trigger a productive intervention or an unproductive distraction for the environment shared by the observer and the observed. How individual and group attention is channeled and regulated, based on all of these individually provided and observed cues, can significantly impact organizational productivity.

Within that negotiated model of attention, there are precisely two ways in which attention is controlled: self-regulation (either by the observer or the observed) and boundaries to observation. As stated in the previous chapters, a combination of a gospel of transparency and cheap technological tools to fuel it has substantially reduced boundaries to observation across workplaces. What does that mean for attention? That depends on what has happened to self-regulation as a result.

The qualitative field work presented in Chapter 2 suggests that self-regulation has taken up the slack, at least at PrecisionMobile. While the word “insight” is derived from the Old Dutch “seeing inside,” insight comes not just from what we see but what we know about how we are seen. From an early age, human beings discover how to attract attention of others with their actions—it is a key survival instinct for newborns (Lorenz, 1943). Human beings simultaneously

learn two ways of not attracting attention when they do not want it: avoiding activities that will attract attention or hiding those activities from the observation of others. At PrecisionMobile, deviance was chilled by the presence of an observer within sight, made possible by the transparency that made the scope of observability so wide on the factory floor. Whether intentionally coercive or not, transparency had made it more expensive to "look weird" and encouraged self-regulation of attention through either hiding behavior or simply the avoidance of deviance altogether. The survey results demonstrate a reversal of that phenomenon through visible privacy boundaries that supported more flexible control of attention. Visible privacy gave the observed a mechanism to channel, at least to some extent, the attention of the observers. Not everything benefits from being screened by every observer—some sights can be misinterpreted when seen and, at the very least, cost an organization in time spent explaining and resources distracted from higher-value activities. As Rosen (2000: 34) put it, "privacy protects us from being judged out of context in a world of short attention spans." Transparency is a blunt tool; visible privacy provided the observed with agency to determine when attention is valuably attracted. With that agency came greater focus on valuable communication ties, more line-level confidence, and an acquired taste for privacy, in place of covert negotiations, to channel attention on the factory floor.

It is worth noting, albeit tangentially, that such a result finds an interesting analogy in the on-going research into the productivity of open offices (e.g., Sundstrom et al., 1980). The original rationale for open offices, like visual factories, was to foster communication among workers to increase collaboration and innovation (Brennan et al., 2002). And yet, many recent studies are showing that "people have shorter and more superficial conversations in open offices because they're self-conscious about being overheard" (Tierney, 2012). Researchers at Finland's Institute

of Occupational Health, in a study of open offices, have found a decline of 5-10% on the performance of cognitive tasks requiring efficient use of short-term memory (Hongisto, Virjonen, & Keränen, 2007). While their task was quite different than the assembly of thousands of 3G USB datacards, to describe that assembly as a cognitive task requiring efficient use of short-term memory would seem quite appropriate, although the decline in performance was even greater.

The privacy curtain reversed that decline. It negotiated attention by providing visible, designed privacy in place of real-time self-regulation. In doing so, it improved tweaking, experimentation, and the avoidance of negative distractions by redirecting communication towards more productive, enabling ties, encouraging confidence on the lines, and providing a level of freedom within the curtain that actually created more transparency within the boundary than had existed previously. These outcomes contributed to an acquired taste for the privacy boundary in place of all of the hiding behavior (self-regulation) that had previously formed the basis for negotiating attention on the factory floor.

Open Questions on an Attention-Driven View

Sometimes anomalies in behavior are neither productive nor innocent. In the case of bad intentions, channeling of attention elsewhere can be highly problematic. While out of the scope of this work, an open question is how privacy boundaries manage the cost of additional risk with the benefit of additional productive deviance. One view is that observability does not raise the likelihood of catching bad actors—as Rousseau (1755) concluded many years ago, "auditing of accounts, instead of exposing frauds, only conceal them; for prudence is never so ready to conceive new precautions as knavery is to elude them." When, for example, the Freedom of Information Act (FOIA) made all written communication in the federal government public, public servants stopped writing things down. If that effect is as generalizable as Rousseau

suggests, then increasingly strong tools for transparency, available at low technological cost today, may nonetheless be quite costly in chilling what would otherwise be valuable weird-looking behavior without compensating benefit. That, however, is an empirical question which remains to be addressed.

More generally, taking an attention-driven view of productivity suggests interesting opportunities in research on control. As discussed in Chapter 4, one of the great, evergreen questions in the field of organizational behavior has been how much control management should exert over complex organizations and their employees. Recall that Senge (1990) sought to achieve control without controlling, which Sewell (1998) reframed as "how do you achieve control without appearing to control?" Sewell answered, drawing on Poster (1990), that the Marxist "mode of production" is being supplemented, or supplanted, by a "mode of information," where "new technology has enabled the erection of a surveillance superstructure throughout society that unobtrusively influences almost all aspects of daily life, especially work life" (Sewell, 1998: 403).

What if, instead, attention were a more appropriate lens than surveillance for theorizing about mechanisms for control today? For example, while surveillance is often tied to control, sometimes broad surveillance makes hiding easier because of the sheer volume of data needing to be processed—a needle is harder to find in a larger haystack (O'Neill, 2006: 72). With the increasing quantity of data, "transparency has become more translucent, that is to say, semi-transparent" (Drucker & Gumpert, 2007: 495). Attention would seem to be a more precise tool, not just for productivity but also for other related phenomena, in a "mode of information" age. On the one hand, attention is harder to study. On the other, it may offer far more explanatory

power. As with this work, there is an opportunity to connect the micro-level theory on attention to macro-level organization constructs.

Implications: Productivity and Selective Opacities

Machines do their job the same way whether they are being observed or not. Human beings, however, may modify their behavior based on who they are observing, who is observing them, or what is being observed (e.g., behavior versus outcome). Organizations continue to consist primarily of human beings, and thus observability impacts the potential of attentional capture of the observer and therefore the behavior of the observed. In the past, under conditions of less transparency, attention was more often negotiated through physical spaces. In an age when everything increasingly feels as if it is under the spotlight, the means for negotiating, and regulating, attention are changing. That is as true for the worker in a completely open workplace as it is for the virtual worker in bunny slippers at home.

Whether that trend is positive or negative for productivity depends on how precisely theory is built and used on the impact of transparency, and privacy, on attention and productivity. While research in transparency, privacy, attention, and other related areas provide fertile soil, descriptive theory on attention in organizations is still in its formative stages of theory building, yet promises significant implications for practice. If organizational members—the observers and the observed—are subject to bounded rationality (Simon, 1947), then thinking carefully about how to design the most productive attention-focusing boundaries to build, rather than leaving attention to be negotiated through behavior, may improve performance.

As a first step, this research at PrecisionMobile suggests that properly-designed privacy boundaries—selective opacities in the design of the organization—can productively channel

attention in organizations for substantially increased performance. At the same time, PrecisionMobile is just one context. In the recent popular press about Yahoo's telework policies, it appears employees may have been abusing the privacy afforded to them by working from home. At another extreme, total observability may be entirely appropriate in environments—like casinos (Merchant and Traynor, 1983)—where one wants strict repetition rather than ingenuity-based performance improvement. Ultimately, how effective selective opacities are for performance will depend on how well they are designed for a particular organization, context, or time.

Chapter 7: Open Questions for Future Research

In good field research, it is common to have more questions at the end than at the beginning. This chapter briefly summarizes the three that appear most promising.

Connections to Authenticity in Culture and Leadership

Of all of the results at PrecisionMobile, one of the most remarkable is that the curtains at PrecisionMobile increased the hourly performance of the workers by 10-15% *without* increasing the variance of hourly performance (Table 5C). This speaks quantitatively to the observation that previous efforts at transparency had not triggered improved operational control, but instead only a myth of control, because structural barriers to attention had been replaced with self-regulatory ones. In other words, as Chapter 5 and Chapter 6 suggest, at PrecisionMobile there was an inevitability to privacy: attempt to deprive human beings of visible boundaries, and they will create encrypted boundaries in their place in order to channel attention on the factory floor.

Future research will be required to answer the question of whether authenticity in organizational culture, or authenticity in leadership, can overcome that seeming automatic hiding response triggered by individuals subjected to increasing levels of observation. For the moment, the existing data is scarce yet sobering: whether in factories (e.g., Burawoy, 1979, 1998; Hamper, 1986; Mars, 1982; Roy, 1952, 1960), professional offices (Hongisto et al., 2007), the public sector (Hood, 2007), or at PrecisionMobile, increasing levels of transparency "can encourage people to be less honest, so increasing deception and reducing reasons for trust; those that know that everything that they say or write is to be made public may massage the truth" (O'Neill, 2006: 73) in order to self-regulate the attention garnered by their activities.

It remains possible, however, that this phenomenon is only experienced by certain organizations like PrecisionMobile. The field-based nature of this experimental research, as well

as those cited above, required focusing on a single site, making generalizability this study's largest potential limitation. For example, because this research was limited to one organization to maintain the rigor and comparability of the field experiment, there was no variance in organizational culture and therefore no data to investigate the influence of organizational culture (e.g., authenticity of culture) on the relationship between transparency and performance. An organizational often sources its authenticity, and the authenticity of its leadership, from its organizational culture (George, 2007; Kotter & Heskett, 1992). There are also reasons to believe that organizational culture could significantly affect the relationship between transparency, privacy, and attention. Research on Toyota, for example, suggests that knowledge transfer and organizational performance benefit from transparency in the presence of a complementary "culture of transparency" (Spear & Bowen, 1999). Given the inability of most organizations to replicate the success of the Toyota production system (Spear, 2009) and Toyota's own recent inability to sustain it, organizational culture alone does not appear to resolve this attentional challenge, but there are likely to be significant opportunities for future research on the role of organizational culture in moderating this relationship among transparency, learning, control, and attention, on one hand, and performance on the other. Precision's managers believed they supported an organizational culture that encouraged speaking up (Detert & Edmondson, 2011) and discouraged organizational silence (Morrison & Milliken, 2000), but without an empirical evaluation of the culture, for example through comparison across sites or geographies, a better understanding of the impact of culture on the relationship between transparency and performance remains an opportunity for future research.

Indeed, the PrecisionMobile site is notable for its Chinese location. Several recent books and articles have described in detail the personal ambitions, challenges, successes, and failures of

migrant workers in China who have fueled the Chinese outsourced-manufacturing miracle (Chang, 2009; Chen, 2008), while a number of other authors have contributed significantly to our understanding of management and organizational challenges specific to China (Barney & Zhang, 2009; Tsui, 2007). To the extent that the results presented here are influenced by the unique characteristics of Chinese manufacturing and migrant workers, generalizability beyond that context will be limited, although these features now characterize a majority of global manufacturing production.

Beyond Manufacturing

PrecisionMobile's highly operational context is one of the more conservative settings for an experiment of this kind. More so than most other areas of management theory, operations theory would predict transparency to be valuable for learning and performance, particularly on a factory floor, offering some indication that a similar logic would hold in less industrial settings.

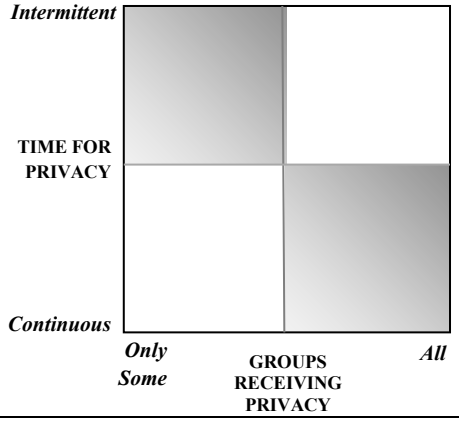
I chose a manufacturing context for this work because both performance and activity were highly transparent. In professional services settings, where activity may be equally transparent but performance is far more difficult to track, transparency, privacy, and attention may operate differently. Throughout the field research at PrecisionMobile, it is important to remember that performance was always being tracked. It is only via that mechanism that I was able to measure the 10-15% performance improvement. In environments where that is not the case—where performance is not as "simple" to observe as defect-free output—transparency, privacy, and attention may operate somewhat differently. Future research will be required, either in other contexts or in the laboratory, to study more scientifically how the results here may or may not generalize to other settings and geographies.

Time

A particularly interesting avenue of research may involve how cyclicality of attention—organizational design which channels attention at defined intervals—may lead to high performance and authenticity. I was unfortunately unable to take the experiment full cycle by removing the curtains and observing the impact on performance. August through November is the busy season for PrecisionMobile, as over one-third of annual sales of mobile devices are estimated to occur during the winter holiday season. As cooperative as PrecisionMobile executives were, they were understandably reluctant to make any major modifications to the lines during peak season. Once the window for making changes reopened in December, product cycles had run their course, the product mix was changing rapidly, and the factory was once again reconfiguring itself—of the 32 lines I studied, only eight were scheduled to remain operational by the end of the month. In January, ordinary attrition also ran its course: after the Chinese New Year holidays, when all workers traditionally go home to visit family, fewer than half of the operators on the studied lines returned to the factory, with new operators taking their place. As a result, comparability between time periods became impossible to achieve. Future research may be able to examine the on-and-off cycling of visible privacy to understand more precisely the relationship among forms of privacy, learning, and organization design. A particularly fertile avenue of investigation would appear to be a study that investigated not whether there should be a curtain but, rather, when and for how long particular kinds of groups should be given their time inside the curtain, similar to some of the financial accounting research on the ideal periodicity of public reporting.

In Figure 7A, the research at PrecisionMobile is situated in the upper left cell: some groups (not all) received privacy, and they did so intermittently (not continuously). It may be that the upper left cell is most productive across contexts, in which case "private time" provides temporary relief from transparency, resulting in increased transparency. In that case, future research should target understanding which groups should have privacy, when, and for how long. Conversely, it may be the case that a different cell, unexplored at PrecisionMobile, will be most productive. Ultimately, these are empirical questions which can be answered using the research in this dissertation as an initial roadmap.

Figure 7A. Future Research Opportunities



Chapter 8: Conclusion
The Paradox of Transparency

We typically assume that the more we can see, the more we can understand about an organization. This research suggests a counteracting force: the more that can be seen, the more individuals may respond strategically with hiding behavior and encryption to nullify the understanding of that which is seen and avoid directing attention to it. When boundaries to visibility fall, invisible boundaries to accurate understanding may replace them at a significant cost. In this research, that cost was a 10–15 percent detriment to performance.

Hence the transparency paradox: broad visibility, intended to increase transparency, can breed hiding behavior and myths of learning and control, thereby reducing transparency. Conversely, I have observed that transparency can actually increase within the boundaries of organizational modules, or what the operators called zones of privacy, when the visible component of transparency is decreased or limited between them.

This dissertation does not challenge the value of transparency, or *accurate* observability. Instead, it challenges what, and how much, individual observers should see in order to achieve it. Because the mere presence of a manager, in line of sight of an employee, may affect employee performance in negative ways, management by walking around may sometimes be inferior to management by standing still. In this study, creating zones of privacy around line workers' activities did not result in slacking off or cutting corners. Instead, the zones of privacy improved transparency within the line and, with it, improved productive deviance, experimentation, and focus on productive work. While hourly defect-free production results remained transparent to all via the IT system, line activities remained visible only to those who were best suited to innovate: the line operators. The establishment of a zone of privacy around the line allowed improvement rights to be owned by those on the inside, encouraged more transparency within the visibility boundaries, and ultimately enabled an increase in organizational performance.

The transparency and privacy literatures have been circling an intellectual cul de sac for too long. With performance as the goal, it is time to bring theory together and start making progress towards unified theory and management of privacy and transparency. Visual privacy is an important performance lever but remains generally unrecognized and underutilized. Paradoxically, an organization that fails to design effective zones of privacy may inadvertently undermine its capacity for transparency because of how attention is negotiated.

It is beyond the scope of this dissertation to determine when visibility is and is not productive—in other words, when it produces productive deviance versus permitting unproductive deviance. The goal here is far more modest: to establish that there are cases in which privacy can be productive for groups. Chapter 2 demonstrated that visibility can be unproductive, and Chapter 3 produces evidence that privacy has been viewed as productive for centuries. Chapter 4 suggests that observability favors control over learning, and thus the two may operate in more productive balance when selective opacities exist within the organization. Using field experiment data, Chapter 5 argues that two forms of privacy exist—visible boundaries and encrypted, hidden ones—as substitutes, with visible boundaries achieving higher levels of productivity than encrypted ones, and questions whether we would ever be able to get rid of both, even in the most transparent of environments. Chapter 6, using self-reported survey data on life inside the curtained lines, encourages us to think hard about the interaction between attention and aspects of organizational design, like privacy boundaries, which can help to channel attention to productive, and away from unproductive, uses.

As suggested by Chapter 7, it remains an open question as to whether that indicates that our tools of transparency remain insufficiently comprehensive, that our tools for authentically regulating attention remain underdeveloped, or that privacy is underappreciated. While research

in this area continues, however, interim investments in additional privacy, like at PrecisionMobile, may offer increased performance at very little cost.

Throughout this dissertation, one message is consistent: seeing all is not. Indeed, even the simple act of seeing can trigger intricate hiding that cloaks the real value of transparent workplaces. Seeing less may mean understanding more. And it also may allow some productive deviance—some level of looking weird—to remain in the organization. Privacy can be productive.

Appendix 6A
Longitudinal Survey

Appendix 6A: Longitudinal Survey (Original)

如果您有问题，请与郝洁良联系，联系电话: 15018342293.

美国哈佛大学－商学院正在对一些优秀的制造型企业做一项调查， 我们将[Precision]列为调查对象以寻[Precision]是怎样不断地改善其业绩以获得目前的卓越地位。我们正用一种新颖的技术来分析工作关系网，我们希望向你们学习，正如我们希望[Precision]能从我们的调查结果中学到东西一样。

我们希望您能在 **x 月 xx 日**前尽快完成问卷，它将只花费您大约 15 分钟的时间。您的参与是自愿的，但为使这个调查能更有效，我们需要所有被邀亲参与者的配合。

在此，我们声明您的问卷将是保密的。此问卷采取不记名方式，也就是说没有任何人能够把您的问卷与您联系起来。同时，所有的回复将避开[Precision]的管理层而由哈佛商学院问卷调查组处理。因此，我们希望您能够诚实回答并认真对待这次调查。

我们将有小礼品赠送以示感谢。我们期待着好的结果出现.

哈佛调查组

Q1. 请在你回答如下问题时，考虑你是如何看待[Precision]的工作环境的。
(Q1-a) 在每一对选项里，请圈出会鼓励你在[Precision]工作更久的那一项。

(a1)	更快的晋升，或更多晋升机会	更多加班机会
(a2)	工作时更多自由，管理松一些，更多空闲时间	更多培训机会 （例如英语，电脑，更多工位训）
(a3)	更多培训机会 （例如英语，电脑，更多工位培训）	更多加班机会
(a4)	更多加班机会	帮助你实现梦想
(a5)	帮助你实现梦想	工作时更多自由，管理松一些
(a6)	工作时更多自由，管理松一些	更快的晋升，或更多晋升机会
(a7)	更多培训机会 （例如英语，电脑，更多工位培训）	帮助你实现梦想
(a8)	更快的晋升，或更多晋升机会	帮助你实现梦想
(a9)	工作时更多自由，管理松一些	更多加班机会
(a10)	更多培训机会 （例如英语，电脑，更多工位培训）	更快的晋升，或更多晋升机会

例:

(a1)	更快的晋升，或更多晋升机会	更多加班机会
(a2)	工作时更多自由，管理松一些，更多空闲时间	更多培训机会 （例如英语，电脑，更多工位训）
(a3)	更多培训机会 （例如英语，电脑，更多工位培训）	更多加班机会
(a4)	更多加班机会	帮助你实现梦想
(a5)	帮助你实现梦想	工作时更多自由，管理松一些
(a6)	工作时更多自由，管理松一些	更快的晋升，或更多晋升机会
(a7)	更多培训机会 （例如英语，电脑，更多工位培训）	帮助你实现梦想
(a8)	更快的晋升，或更多晋升机会	帮助你实现梦想
(a9)	工作时更多自由，管理松一些	更多加班机会
(a10)	更多培训机会 （例如英语，电脑，更多工位培训）	更快的晋升，或更多晋升机会

(Q1-b) 你打算在[Precision]工作多久？ (请选一项)

少于六个月　　六到十二个月　　一到两年　　两到三年　　三到五年　　五年以上

Q2. 从 1 至 5 选择 你认为以下句子的正确程度 （1=完全不同意， 5=完全同意）。问题中提到操作员（指的是你线上的所有操作员），管理人员（指的是所有跟你线上有关的领班，主管，管理员等），和工程师(指的是所有跟你线上工作有关的工程师)。

	完全不同意				完全同意
(Q2-1)					
(a) 如果你在这条线上犯了错误，**其他操作员**会为此责怪你或对你有看法。	1	2	3	4	5
(b) 如果你在这条线上犯了错误，**管理人员**会为此责怪你或对你有看法。	1	2	3	4	5
(c) 如果你在这条线上犯了错误，**工程师**会为此责怪你或对你有看法。	1	2	3	4	5
(Q2-2)					
(a) 这条线上的操作员可向**其他操作员**反映问题及困难。	1	2	3	4	5
(b) 这条线上的操作员可向**管理人员**反映问题及困难。	1	2	3	4	5
(c) 这条线上的操作员可向**工程师**反映问题及困难。	1	2	3	4	5
(Q2-3)					
(a) 这条线上的人有时会因为背景或想法有异而被**其他操作员**排斥或拒绝。	1	2	3	4	5
(b) 这条线上的人有时会因为背景或想法有异而被**管理人员**排斥或拒绝。	1	2	3	4	5
(c) 这条线上的人有时会因为背景或想法有异而被**工程师**排斥或拒绝。	1	2	3	4	5
(Q2-4)					
(a) 当**其他操作员**在场时，你不怕冒险。(例：你不怕尝试与规章不完全相符的操作)	1	2	3	4	5
(b) 当**管理人员**在场时，你不怕冒险。(例：你不怕尝试与规章不完全相符的操作)	1	2	3	4	5
(c) 当**工程师**在场时，你不怕冒险。(例：你不怕尝试与规章不完全相符的操作)	1	2	3	4	5
(Q2-5)					
(a) 这条线上的操作员认为向**其他操作员**寻求帮助是一件困难的事。	1	2	3	4	5
(b) 这条线上的操作员认为向**管理人员**寻求帮助是一件困难的事。	1	2	3	4	5
(c) 这条线上的操作员认为向**工程师**寻求帮助是一件困难的事。	1	2	3	4	5
(Q2-6)					
(a) 我的努力从没有被**其他操作员**故意破坏或削弱。	1	2	3	4	5
(b) 我的努力从没有被**管理人员**故意破坏或削弱。	1	2	3	4	5
(c) 我的努力从没有被**工程师**故意破坏或削弱。	1	2	3	4	5
(Q2-7)					
(a) **其他操作员**珍视并利用我的独特技术与才能。	1	2	3	4	5
(b) **管理人员**珍视并利用我的独特技术与才能。	1	2	3	4	5
(c) **工程师**珍视并利用我的独特技术与才能。	1	2	3	4	5

例:

	完全不同意				完全同意
(a) 如果你在这条线上犯了错误，**其他操作员**会为此责怪你或对你有看法。	1	2	3	4	5
(b) 如果你在这条线上犯了错误，**管理人员**会为此责怪你或对你有看法。	1	2	3	4	5
(c) 如果你在这条线上犯了错误，**工程师**会为此责怪你或对你有看法。	1	2	3	4	5

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Q3: 我们能够提高生产效率, 若这条线上的操作员能够：

	完全不同意				完全同意	请排列左侧七个选项（1 =最重要, 9=最不重要）
更多尝试或创新的隐私(在无监督情况下试验的能力)	1	2	3	4	5	
接触到更多的信息	1	2	3	4	5	
给与更多的资源(工具、设备、人力)	1	2	3	4	5	
给与更多创新或试验的空间	1	2	3	4	5	
给与更多的专业指导或帮助	1	2	3	4	5	
给与更多的培训	1	2	3	4	5	
给与更多更好的生产表现反馈	1	2	3	4	5	
给予操作员更多关于自己产线未来的信息	1	2	3	4	5	
更多监督	1	2	3	4	5	

例:

	完全不同意				完全同意	请排列左侧七个选项（1 =最重要, 9=最不重要）
更多尝试或创新的隐私(在无监督情况下试验的能力)	1	2	3	4	(5)	*1*
接触到更多的信息	1	(2)	3	4	5	*6*
给与更多的资源(工具、设备、人力)	1	2	3	4	(5)	*2*
给与更多创新或试验的空间	1	2	(3)	4	5	*4*
给与更多的专业指导或帮助	(1)	2	3	4	5	*7*
给与更多的培训	1	2	3	4	(5)	*3*
给与更多更好的生产表现反馈	1	(2)	3	4	5	*5*
给予操作员更多关于自己产线未来的信息	(1)	2	3	4	5	*8*
更多监督	(1)	2	3	4	5	*9*

Q4: 从 1 至 5 选择 你认为以下句子的正确程度 （1=完全不同意， 5=完全同意）

	完全不同意				完全同意
在这条线上做得优秀工作， 过望的优秀工作， 会得到认可或酬答。	1	2	3	4	5
线上大多数的操作员有能力解决工作中出现的问题。	1	2	3	4	5
只要有专心和努力，这条线就有能力实现我们的任何目标。	1	2	3	4	5
这条线上的人认为能够做出我们最好的成绩与能够完全发挥实力是重要的。	1	2	3	4	5
这条线上存在没有被充分利用的才能。	1	2	3	4	5
我对我现有的职位以及生产线感到满意。	1	2	3	4	5
我现在工作的无聊程度高于必要的无聊程度。	1	2	3	4	5
我希望在工作中被挑战，从而得到学习与发展的机会。	1	2	3	4	5

例:

	完全不同意				完全同意
在这条线上做得优秀工作， 过望的优秀工作， 会得到认可或酬答。	1	2	(3)	4	5

Q5: 以下的两个问题是关于跟你工作有关或解决工作问题的必要交流。

(a) 当你为改善生产效率或解决工作问题与其他人合作时， 你与以下几组人交流百分比各占多少？

	总百分比	有助关系百分比	禁止关系百分比
其他操作员:	%	%	%
管理人员(领班,主管等):	%	%	%
工程师:	%	%	%
其他:	%	%	%

例:

	总百分比	有助关系百分比	禁止关系百分比
	30 %	*70* %	*30* %
	30 %	*40* %	*60* %
	30 %	*50* %	*50* %
	10 %	*60* %	*40* %

注: 总合 = 100%

注: 总合 = 100%

(b) 当你想在生产中创新或试验时，以下合作者给予多大帮助？

	毫无帮助				极有帮助
其他操作员	1	2	3	4	5
管理人员 （领班、主管等）	1	2	3	4	5
工程师	1	2	3	4	5
LEAN (精益 生产)组	1	2	3	4	5
Kaizen （改善）组	1	2	3	4	5
SGA 组	1	2	3	4	5

例:

	毫无帮助				极有帮助
其他操作员	1	2	3	(4)	5

Q6: 从 1 至 5 选择 你认为以下关于产线上隐私的句子的正确程度 (1=完全不同意, 5=完全同意)

	完全不同意				完全同意
隐私(在无监督情况下试验的能力)对于我在工作上尝试新方法的能力很重要。	1	2	3	4	5
在产线上我有足够的隐私去尝试。	1	2	3	4	5
当我要求尝试时所需的隐私时，其他人反映积极。	1	2	3	4	5

其他关于隐私对您的重要性的评论: _____

Q7. 请提供你的个人信息：

在[Precision]的工龄 （月） (例: 15): _____

生产线（例：F71）： _____

职位 （请选一项） : 操作员 其他：_____

注：想参与我们进一步的研究并同时获得奖金报酬吗？请用手机短信将你的名字发送给郝洁良， 联系电话：**15018342293**， 或电子信箱：**jhao@hbs.edu.**

感谢您对此调查的参与。您的回馈对我们十分重要并将极大协助我们了解[Precision]是如何达到如此高效率的成果。我们期待在未来与您分享此项研究的结果。

Q1. Please take a moment to consider your views on the working conditions in the factory and answer the following questions with those conditions in mind.

(a) For <u>each of the following pairs</u>, please circle the <u>one option</u> that would be most likely to encourage you to stay at Precision longer:

(a1)	Faster promotion / more promotion opportunities	Higher pay / more overtime pay
(a2)	More freedom / more free time	More training opportunities (e.g., English, computer, management)
(a3)	More training opportunities (e.g., English, computer, management)	Higher pay / more overtime pay
(a4)	Higher pay / more overtime pay	Assistance to realize your dream
(a5)	Assistance to realize your dream	More freedom / more free time
(a6)	More freedom / more free time	Faster promotion / more promotion opportunities
(a7)	More training opportunities (e.g., English, computer, management)	Assistance to realize your dream
(a8)	Faster promotion / more promotion opportunities	Assistance to realize your dream
(a9)	More freedom / more free time	Higher pay / more overtime pay
(a10)	More training opportunities (e.g., English, computer, management)	Faster promotion / more promotion opportunities

EXAMPLE:

(b1)	Faster promotion / more promotion opportunities	Higher pay / more overtime pay
(b2)	More freedom / more free time	More training opportunities (e.g., English, computer, management)

(b) How long do you plan to stay at Precision? (Please circle one option)

Less than 6 months **6-12 months** **1-2 years** **2-3 years** **3-5 years** **More than 5 years**

Appendix 6A (Continued): Longitudinal Survey (English Translation)

Q2. On a scale of 1-5 (1=strongly disagree, 5= strongly agree), please state how much you agree or disagree with the following statements about your line.

		Strongly Disagree				Strongly Agree
Operators on your line are able to bring up problems and tough issues to…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
If you make a mistake on the line, it is often held against you by…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
People on this line are sometimes rejected for being too different by…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
It is safe to take a risk on this line when observed by…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
It is difficult for individuals on this line to ask for help from…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
My efforts are never deliberately undermined through actions by…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5
Working with members of this line, my unique skills and talents are valued and utilized by…						
(a)	other operators	1	2	3	4	5
(b)	line management	1	2	3	4	5
(c)	engineers	1	2	3	4	5

EXAMPLE:

		Strongly Disagree				Strongly Agree
Operators on your line are able to bring up problems and tough issues to…						
(a)	other operators	1	2	(3)	4	5
(b)	line management	1	2	(3)	4	5
(c)	engineers	1	2	(3)	4	5

Appendix 6A (Continued): Longitudinal Survey (English Translation)

Q3: Operators on this line could dramatically improve performance if we had:

	Strongly Disagree				Strongly Agree	Please rank, from most important (=1) to least important (=7)
More privacy	1	2	3	4	5	
Access to more information	1	2	3	4	5	
Access to more resources	1	2	3	4	5	
More freedom to experiment on the line	1	2	3	4	5	
Access to more expert assistance	1	2	3	4	5	
More training	1	2	3	4	5	
More feedback on line performance	1	2	3	4	5	
More information about line objectives	1	2	3	4	5	
More supervision	1	2	3	4	5	

EXAMPLE:

	Strongly Disagree				Strongly Agree	Please rank, from most important (=1) to least important (=7)
Access to more information	1	2	3	(4)	5	**2**
Access to more resources	1	2	(3)	4	5	**1**

Q4: On a scale of 1-5 (1=strongly disagree, 5= strongly agree), please state how much you agree or disagree with the following statements about your line.

	Strongly Disagree				Strongly Agree
Doing excellent work, beyond expectations, is rewarded on this line.	1	2	3	4	5
Most people on this line have the ability to solve the problems that come up in our work.	1	2	3	4	5
With focus and effort, this line can do anything we set out to accomplish.	1	2	3	4	5
It is important to people on this line to be the best we can be.	1	2	3	4	5
There is underutilized talent on my line.	1	2	3	4	5
I am satisfied with my current role and line.	1	2	3	4	5
My job is more boring than it needs to be.	1	2	3	4	5
I would like to be challenged more so that I can learn and advance.	1	2	3	4	5

EXAMPLE:

	Strongly Disagree				Strongly Agree
Doing excellent work, beyond expectations, is rewarded on this line.	1	(2)	3	4	5

Q5: The following two questions involve communication necessary for you to do your work or solve complex problems posed by your work.

(a) When you are communicating with others to improve line performance or solve problems, what percentage of your communications are with each of the following groups?

Other Operators:	%
Line Management (Supervisors / Leaders):	%
Engineers:	%
Other:	%

EXAMPLE:

Other Operators:	30%
Line Management (Supervisors / Leaders):	30%
Engineers:	30%
Other:	10%

Note: Total = 100%

(b) When you are trying to experiment/innovate on the line, how helpful are the following as collaborators?

	Not Very Helpful				Very Helpful
Other Operators on your line	1	2	3	4	5
Line Management (Supervisors / Leaders)	1	2	3	4	5
Engineers	1	2	3	4	5
Lean Team	1	2	3	4	5
Kaizen Team	1	2	3	4	5
SGA Team	1	2	3	4	5

EXAMPLE:

	Not Very Helpful				Very Helpful
Other Operators on your line	1	2	(3)	4	5

Q6: On a scale of 1-5 (1=strongly disagree, 5= strongly agree), please state how much you agree or disagree with the following statements about privacy on your line.

	Strongly Disagree				Strongly Agree
Privacy is very important in allowing me to experiment with innovative processes or approaches to my work	1	2	3	4	5
I have sufficient privacy to experiment in private on the line	1	2	3	4	5
Others respond positively when I ask for privacy to experiment on the line	1	2	3	4	5

Additional Comments About the Value of Privacy on the Line:

_____

Q7. *Please provide the following information about yourself*

Production Line Number (e.g., S64): ☐

Tenure at Precision (in months) (e.g.: 15): ☐

Position (please circle): Operator Other: _____

Thank you again for your participation

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