Managing Multiple Goals: Research and Teaching in Colleges

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ABSTRACT: We examine management practices in organizational settings where employees work towards multiple goals that are often not aligned. Using longitudinal data that we collected from close to 18,000 students and 5,000 faculty in 260 college departments across India and in line with theoretical predictions from a standard principal-agent model (in which agents/principals have multiple tasks/goals), we find that management practices are associated with an increase in research output but not student learning. Management practices are associated with higher research productivity in research-oriented departments but do not appear to improve student learning in either research- or teaching-oriented departments. In cases in which organizations have multiple goals, management practices might be less influential than previously found.

Keywords: management practices, multitasking, colleges, research, teaching, student skills

JEL Codes: I23, J3, L2, M5

A growing literature finds that a core set of management practices—such as whether targets are defined and assessed and whether workers are incentivized accordingly—are associated with improved organizational performance across a wide range of industries and countries (Bloom and Van Reenen 2007, 2010, Tsai et al., 2015; Sadun, Bloom, and Van Reenen 2017, Rasul and Rogger 2018).[1] Additionally, there is recent evidence that management training

[1] "Core" practices, originally identified by John Dowdy and Stephen Dorgan at McKinsey (Sadun, et al. 2017), include goal management (target setting), performance monitoring, personnel/talent management, and operations management (discretion). Management practices are distinct from the introduction of consulting services, where there is often large heterogeneity in the specific managerial practices that are introduced (Bruhn et al., 2018). Other scholars term these "core" practices as "advanced" or "modern" management practices (Bender et al. 2018; Lee 2018 respectively).

leads to improved management practices and organizational performance.[2] In light of these findings, policymakers and researchers are increasingly calling for the adoption of core management practices for public sector reform and economic development (World Bank 2012; McKenzie et al. 2015; OECD 2017).

Despite mounting evidence, however, little is known about the effects of core management practices in organizational settings where employees work towards multiple goals that often are not aligned. In such settings, managers must decide how to control and allocate resources, including worker time, across multiple tasks (e.g. Luo et al. 2019). Moreover, such settings are common. Government officials attempt to simultaneously provide law and order, collect taxes, as well as design and implement policies. Lawyers, accountants, and management consultants provide a variety of services to current clients while attempting to recruit new ones. A rich theoretical literature on incentives in organizations suggests that there are limits to the degree that managers can successfully elicit worker performance in these types of situations—in particular, where multiple tasks are substitutable and vary in how easy they are to measure and/or performance measures are poorly aligned with employer goals (Alchian and Demsetz 1972; Holmstrom and Milgrom 1991; Baker 1999; Dixit 2002).

We take a closer look at this question by focusing on the higher education sector. In our study context, college administrators manage two major tasks/goals: teaching and research.[3] Ample evidence suggests that teaching and research may be substitutes rather than complements (Fox 1992; Hattie and Marsh 1996; Fairweather 2002; Link et al. 2007; Ouardighi et al. 2013). In

[2] Management *training* is found to improve firm performance across a range of different contexts, from increasing productivity rates at textile firms in India (Bloom et al., 2013) to reducing fuel wastage by airline captains (Gosnell et al., 2018), to improving student achievement scores in K-12 public schools in Houston, Texas (Fryer 2017).

[3] As Max Weber theorized more than a century ago, college administrators and faculty must balance their effort between teaching and research, what he termed the "double aspect" of being a scholar (Weber 1917).

contrast to research performance (as often reflected in the quantity and quality of research publications), teaching performance (or student learning as often reflected in student achievement gains) is also particularly difficult to measure (Neal 2011; Boyd et al. 2013). Commonly used proxies for teaching performance (such as student evaluations or end-of-term exam scores) may further be subject to gaming by faculty (Holmstrom and Milgrom 1991; Dixit 2002). Given the diversity of higher education institutions and the differing weights they may place on the importance of teaching and research, there could also be heterogeneity in the way that core management practices can lead to increases in teaching and research productivity.

To examine the relationship between core management practices and teaching and research productivity, we analyze longitudinal data that we collected from 260 college departments, 4,619 faculty, and 17,696 undergraduate STEM students in India. Specifically, we applied the World Management Survey (WMS) to interview department chairs (as in McCormack et al. 2014). In contrast to previous studies examining management practices and education, we also administered standardized tests of domain (subject)-specific academic skills (math and science) as well as domain-general higher order thinking skills (critical thinking and quantitative literacy) to students in these departments at the start of college and after two years. College administrators and employers regard learning in both domain-specific and domain-general skills as critical for graduate employability and productivity (Oliveri and Markle 2017). Finally, we collected information on the research productivity (publications) of all departmental faculty.

Our granular and extensive longitudinal data allow us to improve upon prior studies in several respects. First, to the best of our knowledge, this is the first large-scale study to examine the relationship between core management practices and individual-level college student and faculty outcomes.[4] Second, unlike previous studies, we estimate the relationship between management practices and objective outcomes of teaching using value-added specifications that control for the standardized exam scores of students as they enter college.[5] Controlling for baseline standardized exam scores can account for substantial bias, for example, in estimates of teacher and school quality (Chetty, Friedman, and Rockoff 2014; Koedel 2015). Third, our data enable us to explore the relationship between management practices and teaching and research outcomes by the management-orientation (teaching versus research) of institutions.

We present three sets of findings. First, we find that core management practices—in particular, increases in goal- and performance-oriented management practices—are associated with increases in research productivity. Second, and by contrast, our precise value-added estimates suggest that core management practices do not increase student learning (in either domain-specific or domain-general skills). Third, we find that the relationship between core management practices and outcomes depends on the management orientation of institutions: core management practices are associated with increases in research productivity in research-oriented departments, but not in teaching-oriented institutions. In contrast, core management practices do not appear to lead to increases in student learning in either teaching- or research-oriented departments.

Our paper contributes to the literature in three ways. First, and most directly, our results inform a long-standing debate about the tradeoffs associated with managing higher education for teaching versus research. In particular, our findings support suspicions that colleges' extant management practices contribute to improved research but at least not directly to improved

[4] McCormack et al. (2014) examine aggregate university or department level ranking and outcomes. Bloom et al. (2015) examine high school level pupil outcomes.
[5] Objective, standardized exam scores (as opposed to, for example, subjective, non-comparable student evaluation results) across a large number of institutions are rare.

teaching (Tuckman and Hagemann 1976; Cech 2003). Second, we illustrate how, in the context of education, core management practices may not always improve student learning.[6] Third and most generally, our results connect the management literature to the literature on incentives in organizations (Holmstrom and Milgrom 1991; Dixit 1997; Baker 1997) by highlighting the limits of core management practices when an organization uses the same individuals to work towards multiple goals. Core management practices are far from universal: while they improve performance in a number of situations, they may fail to improve performance in the presence of multiple interdependent objectives.

2. Theory

Relying on Holmstrom and Milgrom (1991), Dixit (1997), and Baker (1997), we use a standard principal-agent model to examine the role of core management practices in organizational settings where agents undertake multiple tasks towards multiple goals.[7] In our study context, faculty (agents) are tasked by college administrators (principals) with two main tasks: teaching and research.[8] This is with the purpose of producing two outcomes: student learning (as typically measured by value-added gains in student achievement) and research output (as typically measured through research publications).

Consider the following linear production function:

$$\mathbf{y} = \mathbf{M}\mathbf{x} + \mathbf{e} \tag{1}$$

[6] Bloom et al. (2015) examine the management practices of 1,800 high schools across 8 countries based on interviews of school principals. They find that better management practices are associated with better student outcomes at the school level. McCormack et al. (2013) survey 250 departments in UK universities and also find a significant positive association between management practices and university rankings.
[7] Organizations that pursue multiple outcomes can sometimes differentiate tasks such that agents have singular roles, but task differentiation is often not possible, resulting in the same agent being responsible for multiple tasks. See Alchian and Demsetz (1972).
[8] Over 90% of the department chairs in our analytical sample note that they must manage both teaching and research.

where **x** is a vector of a faculty member's effort on two tasks (teaching and research) $(x_T, x_R)'$, and **y** is a vector of the two outcomes (student learning and research output) $(y_T, y_R)'$. **M** is a 2x2 matrix of the marginal product of effort on each task. **e** is a vector of random error terms with variance-covariance matrix **V**.

$$\mathbf{V} = \begin{bmatrix} v_T & 0 \\ 0 & v_R \end{bmatrix}$$

The cost to effort for each task is positive and increasing. We represent the cost matrix **K** as:

$$\mathbf{K} = k \begin{bmatrix} 1 & \theta \\ \theta & 1 \end{bmatrix}, \quad k>0,\ -1<\theta<1$$

If $\theta>0$, increasing effort on one task increases the marginal cost of the other (i.e. the two tasks are substitutes in terms of effort due to a total effort constraint).

A faculty member's compensation schedule is:

$$w = h + s_T y_T + s_R y_R \tag{2}$$

where h is base salary and s_T and s_R represent bonuses for student learning and research output. The faculty member receives positive utility from expected compensation and negative utility from compensation risk and effort as follows:

$$U = E[w] - \frac{1}{2}\alpha Var[w] - \frac{1}{2}\mathbf{x}'\mathbf{K}\mathbf{x} \tag{3}$$

where α is the faculty member's coefficient of absolute risk aversion, and the last term is the disutility of effort. The faculty member chooses effort levels that maximize (3) subject to a participation constraint $U^* \geq U_0$. Finally, the principal attempts to maximize output (student learning and research output) minus costs (wages) as follows:

$$E[p_T y_T + p_R y_R - w] \tag{4}$$

where $\mathbf{p} = (p_T, p_R)'$ is the value the principal places on student learning and research output.

To focus on the core implications of the model, we make some simplifying assumptions. We assume, initially, that the principal values student learning and research output to the same degree, i.e., $p_T = p_R$.[9] We further normalize the coefficient k in the cost matrix to equal 1. Lastly, we set the production function $\mathbf{M}$ to be an identity matrix so that teaching increases student learning only, research produces research output only, and the marginal products are normalized to one.[10]

Given these assumptions and maximizing equation (3) with respect to the different tasks ($\mathbf{x}$), the optimal allocation of faculty effort on teaching and research is:[11]

$$x_T^* = \frac{s_T - \theta s_R}{1-\theta^2}\ , \qquad x_R^* = \frac{s_R - \theta s_T}{1-\theta^2}$$

According to the above, increasing the bonus for a given task increases effort on that task. Furthermore, when teaching and research efforts are substitutes (θ>0), which we assume given a faculty member's constraint on total time, increasing the bonus for a given task reduces faculty effort on the other task. In other words, increasing bonuses for research output decreases teaching effort and resulting student achievement.

Note that equation (4) can be written as $\mathbf{p}'\mathbf{K}^{-1}\mathbf{s} - h - \mathbf{s}'\mathbf{K}^{-1}\mathbf{y}$**.** After substituting the faculty's response **x*** into equation (1) and using the agent's first order condition $\mathbf{M}'\mathbf{s} = \mathbf{K}\mathbf{x}$, the principal's indirect utility function becomes $U_P = \mathbf{p}'\mathbf{K}^{-1}\mathbf{s} - h - \mathbf{s}'\mathbf{K}^{-1}\mathbf{s}$**.** We further solve for h using the fact that the faculty's participation constraint is binding ($U^*=U_0$) and substitute h^* into

[9] We relax this assumption when we look at heterogeneous effects by whether the department is research-oriented versus teaching oriented. Of course, if the principal places greater value on research (teaching), the bonus and hence effort on research (teaching) will be greater (Prendergast 1999; Dixit 2002).

[10] Results from cross-subject (math versus physics) student fixed regressions show that there is a precisely estimated zero impact of faculty research effort on academic skills (results omitted for the sake of brevity). In addition, we implicitly assume that principals do not assign only teaching responsibilities to some faculty and only research responsibilities to others. This assumption is largely supported by our survey data: the self-reported management focus of 90% of department chairs in CS and EE departments in Indian colleges is on both teaching and research.

[11] The first-order condition is $\mathbf{M}'\mathbf{s} = \mathbf{K}\mathbf{x}$.

the principal's indirect utility function. This returns the principal's indirect utility as a function of $\mathbf{s}$:

$$U_P = \mathbf{p}'\mathbf{K}^{-1}\mathbf{s} - U_0 - \frac{1}{2}\mathbf{s}'\mathbf{K}^{-1}\mathbf{s} - \frac{1}{2}\alpha\mathbf{s}'\mathbf{V}\mathbf{s}$$

Solving for $\mathbf{s}$ in the first-order conditions, the principal's optimal choice of salary bonuses for teaching and research are:

$$s_T^* = \frac{1 + (1-\theta)\alpha v_R}{1 + \alpha(v_T + v_R) + \alpha^2(1-\theta^2)v_T v_R} p$$

$$s_R^* = \frac{1 + (1-\theta)\alpha v_T}{1 + \alpha(v_T + v_R) + \alpha^2(1-\theta^2)v_T v_R} p$$

The above result highlights how differences in difficulty of performance measurement may differentially affect the bonus, and ultimately the amount of effort, associated with each task. This can be seen more easily by taking the ratio of the optimal choice of salary bonuses for teaching and research:

$$\frac{s_T}{s_R} = \frac{1 + (1-\theta)\alpha v_R}{1 + (1-\theta)\alpha v_T}$$

If the variance in the error in student learning (i.e. value-added gains in student achievement) is substantially greater than that in producing publication, i.e., $v_T \gg v_R$, the marginal bonus coefficient on teaching becomes substantially smaller, and ultimately faculty effort on teaching becomes lower.

In our case, measuring student learning (value-added gains in student achievement) is subject to substantial error (Koedel, Leatherman and Parsons 2012; Schochet and Chiang 2013).[12] By contrast, what the principal (and indeed a much larger academic market) values as

[12] There is substantial variation in the way in which department managers try to measure student learning (and subsequently link such measures to faculty pay and promotion). Measures include, for example, results from subjective student evaluations and other faculty evaluations as well as results from standardized end-of-semester exams). Most colleges (ranging from several score to a few thousand in a given region) are affiliated with a

research output (i.e. the quantity and quality of research publications—Fairweather 2002; Hirsch 2005) generally coincides with what is measured and is likely subject to less error. As such, the presence of core management practices in higher education are more likely to improve research outcomes as opposed to teaching outcomes.

A final challenge in managing faculty to improve student achievement is potentially poor alignment between performance measures and principal objectives (Holmstrom and Milgrom, 1991). Although there are high-stakes, domain-specific exams at the end of each semester in Indian colleges, end of semester exam scores may not accurately reflect student learning in the broader sense of value-added gains. Furthermore, domain-general skills (which college administrators and employers consider critical for college students) are rarely measured directly. We could see even smaller impacts on domain-general as opposed to domain-specific student skills due to the lack of assessment of domain-general outcomes. On the other hand, there could be greater complementarities between faculty research and student domain-general (as opposed to domain-specific) skills if faculty research activities have greater positive spillovers on those types of skills.

3. Data and Methods

3.1 Sampling and Data Collection

We sampled computer science (CS) and electrical engineering (EE) related major students that, taken together, represent approximately 24% of STEM undergraduates in India. Our sampling procedure consisted of several steps. First, we identified all undergraduate (four-year,

university that requires students to take standardized end of the semester exams. However, no college in our sample has uses value-added measures to capture the impacts of faculty instruction on student learning.

bachelor's degree) CS and EE related programs in India.[13] Second, using the population frame of all higher education institutions with undergraduate CS and EE programs, we took stratified national random samples of 8 elite and 42 non-elite colleges.[14] We also included data from an additional 13 elite and 83 public non-elite colleges for participation in the study. On average, the additional colleges had a similar student-faculty ratio as the national random sample colleges (19.5 versus 20.6 students per faculty member), a smaller number of students (282 versus 372), and higher average scores among freshmen (approximately 0.2 SDs higher in math, science, critical thinking, and 0.36 SDs higher in quantitative literacy).

We next randomly sampled one CS and one EE department from each sample institution.[15] In each sampled department, we tested all first year (freshmen) students. During the baseline survey, we randomly assigned half of the freshmen to take math and physics exams, one quarter to take a critical thinking exam, and one quarter to take a quantitative literacy exam.[16] In addition to taking the exams, the freshmen also filled out a background questionnaire. The baseline participation rate among enrolled students was extremely high (approximately 92%). Altogether, 17,696 freshmen participated in the baseline survey.

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[13] The CS departments in higher education institutions in India (of which we randomly sampled one at each institution) included Computer Engineering, Computer Science Engineering, Information Science and Engineering, and Information Technology. EE departments in institutions in India included Electrical Engineering, Electronics and Communication Engineering, Electronics and Electrical Engineering, Electronics and Instrumentation Engineering, and Electronics and Telecommunications Engineering.

[14] In India, elite institutions were defined as the India Institutes of Technology (IITs), the Indian Institutes of Information Technology (IIITs), the National Institutes of Technology (NITs), and other institutions that ranked in the top 100 of the National Institutional Ranking Framework (NIRF) developed by the Ministry of Human Resource Development, Government of India.

[15] A small number of institutions only had CS or EE departments (not both). We only sampled one department from each such institution. Altogether, we sampled 266 departments (132 CS departments and 134 EE departments). Five of the departments (three CS and three EE departments) did not participate in the WMS.

[16] The math and physics exams were grade-specific, testing students on the math and physics knowledge and competencies they were supposed to have learned by the start of their first and third years of college (see Kardanova et al., 2017). The critical thinking and quantitative literacy exams are part of the *HEIghten®* assessments from Educational Testing Service (ETS). Constructs underlying both exams were defined according to systematic reviews of research on critical thinking and quantitative literacy in higher education (see Liu et al., 2014a, 2014b).

We also asked department faculty and chairs to fill out questionnaires during the baseline. Specifically, we asked all faculty at each sampled department to provide information about their background, education and work history, and research output over the last three years. We further conducted the WMS (see subsection 3.2. immediately below) with the department chairs and asked them to separately fill out a short questionnaire. Altogether, 4,619 faculty (approximately 75% of faculty) and 260 department chairs (approximately 98% of the 266 possible chairs) participated in the baseline survey.

We followed up with the students that participated in the baseline survey after approximately two years (when they were at the end of their second year of college). During the follow up survey, students repeated the same type of exam they had taken in the baseline (i.e. half of the students that had taken math and physics in the baseline repeated math and physics exams in the follow up, one quarter repeated a critical thinking exam, and one quarter repeated a quantitative literacy exam). The students again filled out a short questionnaire. Approximately 85% of the students (15,061) from the baseline survey participated in the follow up survey.

3.2 Measuring Management Practices

To measure management practices at the department level, we use the World Management Survey (WMS—Bloom and Van Reenen, 2007, 2010). The WMS has been applied to a variety of sectors, from manufacturing (Bloom and Van Reenen 2007) to healthcare (Bloom et al. 2015) to public administration (Rasul and Rogger 2016) to education (Bloom et al. 2012; McCormack et al. 2013). The WMS approach has a strong track record as it has successfully been used to assess management practices in tens of thousands of organizations across numerous countries, enabling us to not only leverage the past experience of previous research teams, but to also situate our findings in the space of a broader literature.

Following McCormack et al. (2013), we adapt the WMS instrument to make it relevant for the higher education sector. We include 21 indicators of management practices grouped into four subcategories as follows – goals, performance, personnel, and discretion. Appendix B further describes each subcategory and the survey questionnaire.[17]

The WMS involves conducting semi-structured interviews of managers (in our case department chairs or heads). A team of two enumerators calls the department chair; one enumerator leads the interview while another listens in. Instead of directly questioning whether the department utilizes a specific management practice, the lead enumerator asks several prompting questions to understand the actual management practices in the organization. The prompting questions are designed to be open and the lead enumerator regularly asks for examples to ensure that a given practice is actually being implemented. To ensure unbiased responses, managers are not told in advance that they are being scored, nor are they shown a score grid during the interview.

After the interview concludes, the two enumerators separately score each of our 21 indicators of management practice on a 1 to 5 scale (separated by half-points), with a higher score indicating better performance. The purpose of having double scoring is to standardize interviews and scoring across teams. If the difference in scoring was a half-point, the average of the scores was taken. If the difference in scores for any management practice is 1 or greater, a reviewer is asked to decide upon a final score for that management practice. Altogether in our study, there were only 41 instances out of 5,586 indicator scores that had to be decided by a reviewer.

[17] We chose to modify our survey instrument from McCormack et al. (2013), which included 17 indicators of management practices spread across four subcategories. McCormack et al. focus on management practices at universities, although they measure department-level performance.

The interviews were carried out in November and December 2017 by a team of twenty enumerators. Before starting with the interviews, the enumerators undertook a rigorous five-day training program using materials developed by the original management interview team at the London School of Economics and shared by McCormack.[18] Enumerators also conducted mock interviews as part of their training. This training helped to ensure a consistent approach to the interview process as well as reliable scoring across enumerators and teams. Following the training, teams of enumerators were assigned to interview department heads. Most teams were randomly assigned to conduct interviews, although we took into account potential regional language preferences of the department heads. Teams were encouraged to conduct interviews in English, although if a department head sought to change the language, our teams would conduct the interviews in that language. Each interview took between 45 to 60 minutes, with enumerators separately scoring interviews afterward. Teams were expected to complete one to three interviews per day. The enumerators held daily cross-team debriefs to resolve any potential challenges or sources of confusion, further ensuring consistent interviews and scoring.

We present distributions of management (total and subcategory) scores for all departments (Figure 1) and by teaching versus research orientation separately (Figure 2). According to Figure 1, management practices vary widely across institutions. This is true for both teaching-oriented and research-oriented institutions (Figure 2). In fact, the distribution of management scores is similar between teaching- and research-oriented universities (Figure 2).

3.3 Statistical Approach

A nascent literature has examined the relationship between key educational outcomes such as student achievement (in K-12 schooling—Bloom et al., 2015) and institutional research

[18] McCormack et al. (2014) conducted a two-day training program. McCormack and others suggested that we include more training time for practice.

rankings (in higher education—McCormack, Propper, and Smith, 2014) with management practices. In examining this relationship, the literature has controlled for potentially confounding factors such as the size of the institutions and whether the institutions are classified as elite. Previous studies have not, however, controlled for the other potential confounders such as baseline achievement scores of students. Controlling for baseline achievement scores is likely important, as they are typically correlated with both outcomes and management practices (Chetty, Friedman, and Rockoff, 2014; Koedel, 2015).[19]

To estimate the relationship between management practices and student achievement, we run the following value-added specification:

$$Y_{idst} = \beta_0 + \beta_1 Y_{ds,t-1} + \beta_2 M_{ds,t-1} + X_{ids,t-1} + \varepsilon_{ids,t-1}$$

where *i* denotes student, *d* department, *s* college, and where *t* corresponds to the end of the second year and t-1 to the start of the first year in college. Y_{idst} is the individual-level achievement of students at the end of year 2 (in math, physics, critical thinking, or quantitative literacy); $Y_{ds,t-1}$ is the corresponding individual-level achievement of students at the start of year 1; $M_{ds,t-1}$ is the management score from the WMS and measured at the department level (either the total score, or sub-scores in goals, performance, personnel, or discretion); and $X_{ids,t-1}$ is a vector of other student (gender, family wealth tercile), department (CS or EE, number of students, student-faculty ratio, and college level baseline covariates (elite or non-elite, public or private, age in years). Importantly, we also control for four different aggregate measures of institutional quality: the average department-level achievement of entering year 1 students in math, physics, critical thinking and quantitative literacy. By controlling for student performance

[19] In fact, in contrast with other baseline covariates, controlling for baseline achievement scores in a value-added specification can account for the vast majority of bias in estimates of teacher and school quality (Chetty, Friedman, and Rockoff, 2014; Koedel, 2015).

individually and in aggregate (in addition to the other student, department and college level characteristics), our estimates should be less biased than those from previous studies and provide us the closest approximation to the effect of extant management practices on student outcomes.[20]

To examine the relationship between management practices and research productivity, we run a similar specification in which the number of faculty publications is the dependent variable and in which we control for faculty background characteristics (faculty age, gender, rank, education level, full-time versus part-time job status) as well as the department and college level baseline covariates.

4. Results

Core management practices have a positive and significant relationship with research productivity (Table 1). According to our full specification, a one SD increase in the total management score is associated with an increase of 0.646 publications per faculty member (statistically significant at the 5% level—Table 1, column 1). Looking at the role of management practices more granularly, a one SD improvement in goals management is associated with an increase of 0.681 publications per faculty member (significant at the 5% level, column 2), and a one SD improvement in performance management is associated with an increase of 0.657 publications per faculty member (significant at the 5% level, column 3). Given the average faculty size of departments in our sample (17.7), better goals and performance management on average are tied to an additional 3.9 publications for a department per annum. This is non-trivial given that the average publications per faculty per annum is 2.9. Personnel management and discretion, by contrast, appear to play a smaller, if not negligible, role in improving research

[20] We nonetheless acknowledge that, even with our full set of controls, management practices may be systematically related to unobservable confounders.

productivity (0.313 and 0.313 publications) respectively—both statistically insignificant, columns 4-5).

However, according to our value-added estimates core management practices have no discernible relationship with the domain-specific (math and science) skills of college students (Table 2, Panels A-B). Estimates from specifications that control for baseline scores are near-zero and insignificant (Table 2, Panels A, B Column 1). The addition of other student level controls (Column 2) and department/college level controls (Column 3) also result in estimates that are close to zero. Overall, the value-added specifications suggest that core management practices have no effect on the domain-specific, academic skills students are taught in college.

Table 2 presents results for a cumulative measure of management practices, but there could be differences in teaching productivity by subcategories of management practice (goal management, performance management, personnel management, or discretion). We test for this in Table 3. We find that none of the four subcategories of management practices are associated with a positive increase on domain-specific student skills in our fully adjusted value-added specifications (Table 3, Panels A-B, last column).

We also find no evidence of positive effects on higher order thinking skills (Table 4). The magnitude of the relationship between critical thinking skills and management is close to zero and not statistically significant in any of the value-added specifications (Table 4, Panel A). Estimates of the effect of core management practices on quantitative literacy skills are also near zero and insignificant (Table 4, Panel B).

In general, we also find no positive relationship between management subcategory scores and higher order thinking skills (Table 5). The only exception is the small positive and significant relationship between goal management and critical thinking (0.059, significant at the

1% level). The positive result might be due to spillovers from increased faculty research to critical thinking skills. On the other hand, the positive estimate may also be due to chance since we are examining a number of coefficient estimates across multiple specifications.

We do find some heterogeneity in the relationship between management practices and research and teaching outcomes, depending on whether the department is research-oriented or teaching-oriented (Table 6).[21] In regards to research productivity, the presence of core management practices are associated with an increase in the number of publications per faculty member in departments with a research orientation (1.644 publications per faculty or 9.7 publications per department per annum, significant at the 5% level) but not a teaching orientation (0.423 publications, not statistically significant even at the 10% level). In regards to student learning, the core management practices do not appear to lead to skill gains, no matter the orientation of the department. The single exception is that core management practices have a positive relationship with critical thinking in research-oriented departments (0.151 SDs, significant at the 5% level—Columns 4). The results, when taken together, suggest that the effects of core management practices depends, in part, on the management orientation of the department: student skills appear to be largely unaffected in research-oriented or teaching-oriented departments, while faculty research productivity is no higher in teaching-oriented departments but is higher in research-oriented departments.

4. Discussion and Conclusion

A robust literature suggests that organizations should perform better when they have clearly defined and attainable targets (goal management), processes in place for monitoring

[21] We define departments in which managers claimed that their management focus is at least as much on research as teaching are "research-oriented" and all other departments as "teaching-oriented".

individual performance (performance management), incentive structures designed for increasing individual performance (personnel management), and agents empowered to make decisions that they think will be in the best interests of their organizations (discretion—Bloom and Van Reenen 2007; 2010; McCormack et al. 2013; Bender et al., 2018). In the face of growing evidence, scholars have suggested that these core management practices might be universally valuable in that they should improve any organization's performance in any sector (Delfgaauw et al. 2012, McCormack et al. 2013). However, theory on incentives in organizations questions whether core management practices, without additional incentive design considerations, should deliver the same benefits in organizations that emphasize more than one task or goal (Holmstrom and Milgrom 1991; Dixit 1997; Baker 1997).

To empirically examine the relationship between core management practices and performance in such organizations, we examined higher education in India, where college departments are focused on both teaching and research. Our findings suggest that departments with core management practices do not result in better student learning: there is a tenuous relationship at best between management practices and increases in student skills. However, core management practices are associated with improved research outcomes, suggesting a conflicting relationship between core management practices and overall departmental performance. This pattern holds in departments that focus on research (as opposed to teaching).

Why do institutions with core management practices in place not enjoy better outcomes, as most other studies have found? We suspect that our findings diverge from the larger management literature because we are examining organizations where one major task (research output) is easier to calculate and to attribute to agents than another major task (student learning). In such situations, effective management practices may produce results along one dimension but not another. As such, our study calls into question the premise that core management practices improve performance in all organizational contexts. Instead, some organizations—and perhaps even some sectors—require rethinking management practices to account for issues surrounding the presence of multiple tasks and goals.

While core management practices may work well for firms that exclusively focus on maximizing profit or for public agencies in which agents pursue singular tasks, the practices appear insufficient when applied to the higher education sector. As suggested in the literature, to maximize impact on multiple outcomes, college administrators are obliged to consider alternatives such as task specialization—whereby some faculty focus on teaching whereas others focus on research—or re-consider the design of management practices such that they balance performance along multiple dimensions (Holmstrom, 2017). Without such considerations, managerial efforts to improve student learning in colleges likely fall short.

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Figure 1 – Distribution of Management Scores

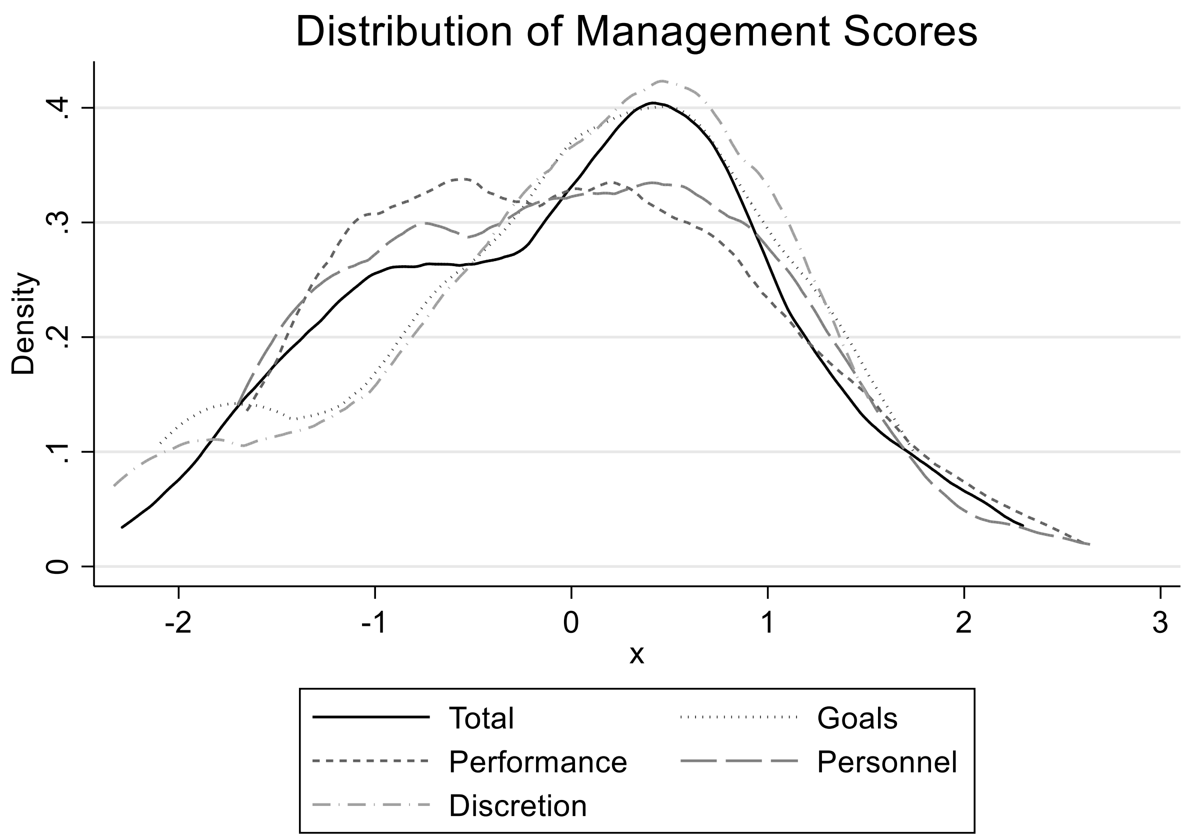

Figure 2 –Total Management Score by Institutional Orientation

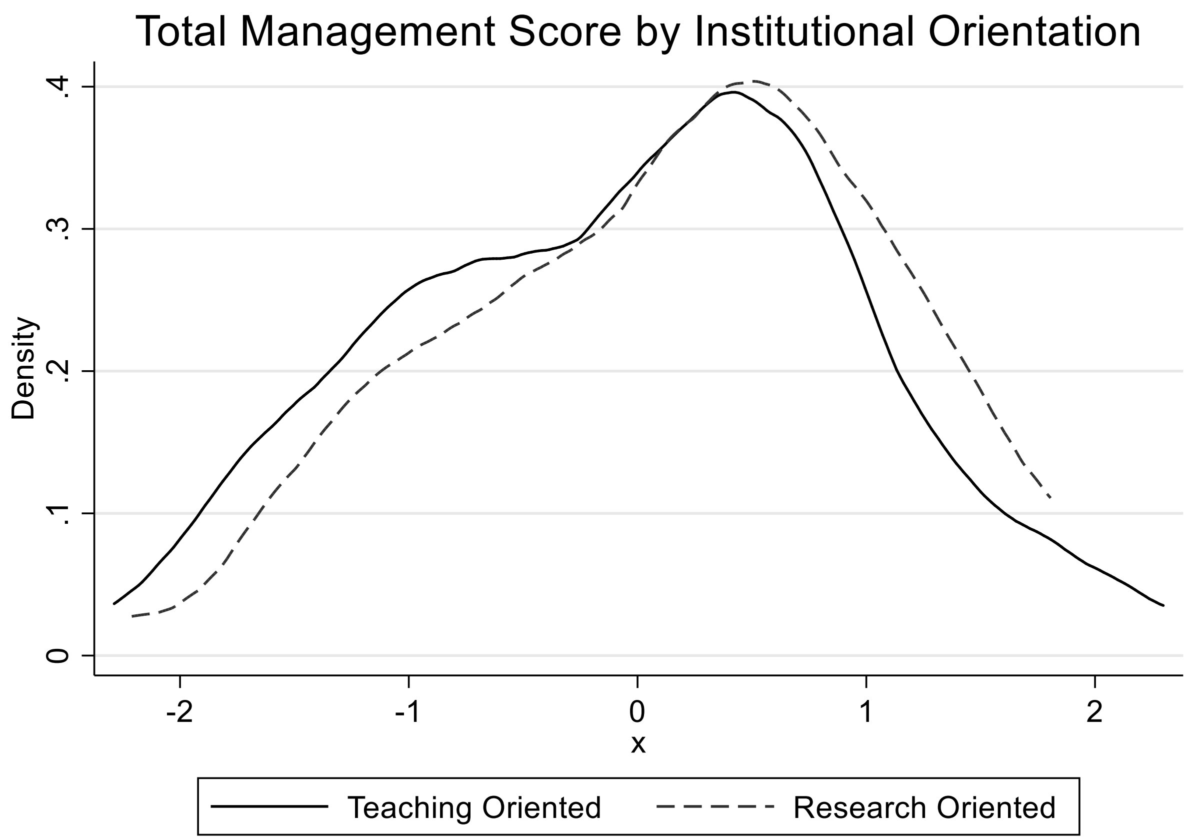

TABLE 1 –MANAGEMENT PRACTICES AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN LAST THREE YEARS)

	Overall	Goal	Performance	Personnel	Discretion
	(1)	(2)	(3)	(4)	(5)
Management (z-score)	0.646**	0.681**	0.657**	0.313	0.313
	(0.272)	(0.287)	(0.263)	(0.295)	(0.267)
Assistant Professor (= 1)	2.805***	2.880***	2.773***	2.803***	2.796***
	(0.651)	(0.647)	(0.650)	(0.652)	(0.654)
Associate Professor (= 1)	5.075***	5.148***	5.088***	5.093***	5.069***
	(0.985)	(0.982)	(0.983)	(0.986)	(0.991)
Full Professor (= 1)	11.793***	11.875***	11.819***	11.777***	11.778***
	(1.909)	(1.907)	(1.912)	(1.909)	(1.917)
Age (years)	0.054	0.053	0.051	0.055	0.054
	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)
Full-time (= 1)	1.310**	1.262**	1.336**	1.406**	1.379**
	(0.600)	(0.600)	(0.594)	(0.591)	(0.590)
Female (= 1)	-0.597	-0.613	-0.603	-0.600	-0.588
	(0.386)	(0.386)	(0.386)	(0.388)	(0.388)
In process of obtaining PhD (= 1)	2.747***	2.716***	2.783***	2.808***	2.794***
	(0.413)	(0.419)	(0.409)	(0.410)	(0.408)
Obtained PhD (= 1)	10.668***	10.673***	10.688***	10.780***	10.751***
	(0.886)	(0.878)	(0.891)	(0.892)	(0.877)
Computer Science (= 1)	-0.231	-0.203	-0.294	-0.234	-0.231
	(0.468)	(0.472)	(0.476)	(0.470)	(0.472)
# of students in department	-0.002	-0.002	-0.002	-0.001	-0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Department student faculty ratio	-0.021*	-0.020*	-0.021*	-0.022*	-0.024**
	(0.012)	(0.011)	(0.011)	(0.012)	(0.011)
Baseline dept. avg. math score	0.927	0.873	0.830	0.926	0.950
	(1.288)	(1.281)	(1.285)	(1.291)	(1.300)
Baseline dept. avg. science score	3.575**	3.715**	3.416**	3.365**	3.387**
	(1.489)	(1.509)	(1.483)	(1.489)	(1.507)
Baseline dept. avg. CT score	0.210	0.242	0.275	0.356	0.378
	(1.036)	(1.030)	(1.038)	(1.059)	(1.048)
Baseline dept. avg. QL score	-0.342	-0.337	-0.164	-0.345	-0.439
	(1.004)	(1.005)	(1.006)	(1.018)	(1.057)
Elite college (=1)	1.088	1.138	1.153	1.452	1.410
	(1.637)	(1.680)	(1.662)	(1.657)	(1.681)
Private college (= 1)	-0.314	-0.047	-0.530	-0.128	0.139
	(0.871)	(0.844)	(0.878)	(0.959)	(0.870)
Age of college (years)	-0.010	-0.011	-0.010	-0.007	-0.006
	(0.023)	(0.022)	(0.022)	(0.023)	(0.023)
Observations	4,556	4,556	4,556	4,556	4,556
R-squared	0.269	0.269	0.268	0.268	0.268

Notes: All "score" variables have been transformed into z-scores. CT = critical thinking, QL = quantitative literacy. Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1.

TABLE 2 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICES (IN TOTAL) ON ACADEMIC SKILLS

	(1)	(2)	(3)
Panel A: Math			
	0.022	0.016	0.005
	(0.024)	(0.024)	(0.016)
Observations	7,587	7,484	7,482
R-squared	0.303	0.310	0.367
Panel B: Science			
	-0.010	-0.012	-0.021
	(0.022)	(0.021)	(0.018)
Observations	7,573	7,475	7,473
R-squared	0.298	0.305	0.344
Baseline Score Control	YES	YES	YES
Other Student Controls		YES	YES
Department Controls			YES

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. Baseline Score is the student-level test score (that corresponds to the outcome variable) in z-scores. Other Student Controls include gender and family wealth (as measured by a home asset index divided into terciles). Department controls include whether the department is CS or EE, number of students in the department, student-faculty ratio in the department, whether the college is elite or not, whether the college is private or public, the years since the college's establishment, and average math, science, critical thinking, and quantitative literacy (z-)scores of entering students. *** p< 0.01, ** p<0.05, * p<0.1.

TABLE 3 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICE SUBCATEGORIES ON ACADEMIC SKILLS

	Math		Science	
	(1)	(2)	(3)	(4)
Panel A: Goal Management (z-score)				
	0.036	0.021	0.004	-0.009
	(0.024)	(0.016)	(0.023)	(0.016)
Observations	7,484	7,482	7,475	7,473
R-squared	0.311	0.367	0.305	0.344
Panel B: Performance Management (z-score)				
	-0.016	-0.005	-0.015	-0.002
	(0.023)	(0.018)	(0.020)	(0.020)
Observations	7,484	7,482	7,475	7,473
R-squared	0.310	0.367	0.305	0.344
Panel C: Personnel Management (z-score)				
	-0.011	-0.006	-0.033*	-0.030
	(0.023)	(0.019)	(0.019)	(0.018)
Observations	7,484	7,482	7,475	7,473
R-squared	0.310	0.367	0.306	0.345
Panel D: Discretion (z-score)				
	0.055**	-0.012	0.018	-0.025
	(0.025)	(0.019)	(0.022)	(0.017)
Observations	7,484	7,482	7,475	7,473
R-squared	0.313	0.367	0.305	0.344
Baseline Score Control	YES	YES	YES	YES
Other Student Controls	YES	YES	YES	YES
Department Controls	NO	YES	NO	YES

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. Baseline Score is the student-level test score (that corresponds to the outcome variable) in z-scores. Other Student Controls include gender and family wealth (as measured by a home asset index divided into terciles). Department Controls include whether the department is CS or EE, number of students in the department, student-faculty ratio in the department, whether the college is elite or not, whether the college is private or public, years since the college's establishment, and average math, science, critical thinking, and quantitative literacy (z-)scores of entering students. *** p< 0.01, ** p<0.05, * p<0.1.

TABLE 4 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICE SUBCATEGORIES ON HIGHER ORDER THINKING SKILLS

	(1)	(2)	(3)
Panel A: Critical Thinking			
	0.041	0.034	0.032
	(0.026)	(0.026)	(0.024)
Observations	3,768	3,712	3,709
R-squared	0.340	0.362	0.391
Panel B: Quantitative Literacy			
	0.019	0.016	0.027
	(0.018)	(0.017)	(0.019)
Observations	3,684	3,628	3,628
R-squared	0.638	0.647	0.658
Baseline Score Control	YES	YES	YES
Other Student Controls		YES	YES
Department Controls			YES

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. Baseline Score is the student-level test score (that corresponds to the outcome variable) in z-scores. Other Student Controls include gender and family wealth (as measured by a home asset index divided into terciles). Department controls include whether the department is CS or EE, number of students in the department, student-faculty ratio in the department, whether the college is elite or not, whether the college is private or public, the years since the college's establishment, and average math, science, critical thinking, and quantitative literacy (z-)scores of entering students. *** p< 0.01, ** p<0.05, * p<0.1.

TABLE 5 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICE SUBCATEGORIES ON HIGHER ORDER THINKING SKILLS

	Critical Thinking		Quantitative Literacy	
	(1)	(2)	(3)	(4)
Panel A: Goal Management (z-score)				
	0.062**	0.059***	0.019	0.022
	(0.026)	(0.022)	(0.019)	(0.019)
Observations	3,712	3,709	3,628	3,628
R-squared	0.365	0.393	0.647	0.658
Panel B: Performance Management (z-score)				
	0.005	0.014	0.001	0.020
	(0.025)	(0.025)	(0.016)	(0.020)
Observations	3,712	3,709	3,628	3,628
R-squared	0.361	0.391	0.647	0.658
Panel C: Personnel Management (z-score)				
	0.003	0.003	0.016	0.035
	(0.024)	(0.025)	(0.017)	(0.022)
Observations	3,712	3,709	3,628	3,628
R-squared	0.361	0.391	0.647	0.658
Panel D: Discretion (z-score)				
	0.043	0.005	0.022	0.015
	(0.028)	(0.022)	(0.021)	(0.019)
Observations	3,712	3,709	3,628	3,628
R-squared	0.363	0.391	0.647	0.658
Baseline Score Control	YES	YES	YES	YES
Other Student Controls	YES	YES	YES	YES
Department Controls	NO	YES	NO	YES

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. Baseline Score is the student-level test score (that corresponds to the outcome variable) in z-scores. Other Student Controls include gender and family wealth (as measured by a home asset index divided into terciles). Department Controls include whether the department is CS or EE, number of students in the department, student-faculty ratio in the department, whether the college is elite or not, whether the college is private or public, years since the college's establishment, and average math, science, critical thinking, and quantitative literacy (z-)scores of entering students. *** p< 0.01, ** p<0.05, * p<0.1.

TABLE 6 – MANAGEMENT PRACTICES, STUDENT LEARNING AND RESEARCH PRODUCTIVITY, BY MANAGEMENT ORIENTATION (RESEARCH VS. TEACHING)

	Publications	Math Score	Science Score	CT Score	QL Score
	(1)	(2)	(3)	(4)	(5)
Management (z-score)	0.423	-0.012	-0.039**	0.001	0.029
	(0.287)	(0.018)	(0.019)	(0.023)	(0.022)
Research orientation (= 1)	-0.814	-0.077	-0.041	-0.133***	-0.079
	(0.769)	(0.053)	(0.035)	(0.049)	(0.048)
Management X Research orientation	1.221*	0.064	0.078	0.150**	0.001
	(0.704)	(0.048)	(0.051)	(0.067)	(0.046)
Observations	4,365	7,189	7,182	3,555	3,495
R-squared	0.272	0.367	0.348	0.397	0.656
Management when research oriented	1.644**	0.052	0.036	0.151**	0.030
Standard Error	0.652	0.044	0.048	0.065	0.042
T-statistic	2.520	1.194	0.747	2.320	0.708

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. Research orientation refers to departments in which the leader says management focus is at least as much on research as teaching. "Management when research oriented" is the relationship between management and outcome variables for research-oriented departments only. All regressions control for student controls (gender, and wealth tercile), department controls (whether the department is CS or EE, number of students, student faculty ratio, average math, science, critical thinking, and quantitative literacy scores of entering students), and college controls (whether the college is elite or not, private or not, and the number of years it has been established). Columns 2-5 also control for student baseline (z-)score (for the test content that corresponds to the test content of the outcome variable). *** p< 0.01, ** p<0.05, * p<0.1.

Appendix A: Additional Tables

APPENDIX TABLE 1 – SUMMARY STATISTICS: STUDENT, FACULTY, INSTITUTION-LEVEL CONTROLS

	Mean	Standard Deviation
Panel A: Student Controls		
Female	0.332	0.471
Panel B: Faculty Controls		
# publications in the last 3 years	8.401	15.358
Assistant Professor	0.684	0.465
Associate Professor	0.136	0.343
Full Professor	0.078	0.267
Faculty Age (years)	35.915	8.464
Faculty Fulltime (= 1 yes)	0.922	0.269
Faculty Female (= 1 yes)	0.394	0.489
Faculty's Highest Degree		
In process of getting PhD	0.171	0.376
Has a PhD	0.268	0.443
Panel C: Department and College Controls		
CS (vs EE) departments	0.497	0.501
Elite (vs non-elite) colleges	0.146	0.354
Private (vs public) colleges	0.265	0.442
Age of college (in years)	37.353	30.233

Notes: Number of student observations = 17,696; number of faculty observations = 4619; number of department observations = 260; number of college observations = 138.

APPENDIX TABLE 2 –MANAGEMENT PRACTICES (TOTAL SCORE) AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN THE LAST THREE YEARS)

	(1)	(2)	(3)	(4)
Management (z-score)	1.095**	0.533	0.680**	0.646**
	(0.550)	(0.336)	(0.295)	(0.272)
Assistant Professor (= 1)		1.256***	2.707***	2.805***
		(0.391)	(0.618)	(0.651)
Associate Professor (= 1)		2.470***	4.917***	5.075***
		(0.935)	(0.934)	(0.985)
Full Professor (= 1)		8.076***	11.585***	11.793***
		(1.760)	(1.910)	(1.909)
Age (years)		0.093	0.047	0.054
		(0.066)	(0.058)	(0.061)
Full-time (= 1)		0.730	1.288**	1.310**
		(0.578)	(0.574)	(0.600)
Female (= 1)		-0.938**	-0.681*	-0.597
		(0.421)	(0.378)	(0.386)
In process of obtaining PhD (= 1)		3.465***	2.753***	2.747***
		(0.408)	(0.412)	(0.413)
Obtained PhD (= 1)		13.595***	10.829***	10.668***
		(0.975)	(0.859)	(0.886)
Computer Science (= 1)			-0.225	-0.231
			(0.464)	(0.468)
# of students in department			-0.002	-0.002
			(0.002)	(0.002)
Department student faculty ratio			-0.021*	-0.021*
			(0.011)	(0.012)
Baseline dept. avg. math score (z-scores)			0.757	0.927
			(1.220)	(1.288)
Baseline dept. avg. science score (z-scores)			4.071**	3.575**
			(1.595)	(1.489)
Baseline dept. avg. CT score (z-scores)			0.051	0.210
			(1.071)	(1.036)
Baseline dept. avg. QL score (z-scores)			-0.352	-0.342
			(0.978)	(1.004)
Elite college (=1				1.088
				(1.637)
Private college (= 1)				-0.314
				(0.871)
Age of college (years)				-0.010
				(0.023)
Observations	4,619	4,582	4,556	4,556
R-squared	0.005	0.243	0.268	0.269

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 3 – GOAL MANAGEMENT AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN THE LAST THREE YEARS)

	(1)	(2)	(3)	(4)
Management (z-score)	1.329**	0.543	0.704**	0.681**
	(0.557)	(0.351)	(0.309)	(0.287)
Assistant Professor (= 1)		1.373***	2.808***	2.880***
		(0.378)	(0.612)	(0.647)
Associate Professor (= 1)		2.619***	5.055***	5.148***
		(0.897)	(0.928)	(0.982)
Full Professor (= 1)		8.262***	11.764***	11.875***
		(1.730)	(1.913)	(1.907)
Age (years)		0.088	0.041	0.053
		(0.065)	(0.058)	(0.061)
Full-time (= 1)		0.790	1.333**	1.262**
		(0.559)	(0.561)	(0.600)
Female (= 1)		-0.945**	-0.701*	-0.613
		(0.420)	(0.379)	(0.386)
In process of obtaining PhD (= 1)		3.426***	2.702***	2.716***
		(0.408)	(0.421)	(0.419)
Obtained PhD (= 1)		13.577***	10.804***	10.673***
		(0.973)	(0.850)	(0.878)
Computer Science (= 1)			-0.186	-0.203
			(0.468)	(0.472)
# of students in department			-0.002	-0.002
			(0.001)	(0.002)
Department student faculty ratio			-0.020*	-0.020*
			(0.011)	(0.011)
Baseline dept. avg. math score (z-scores)			0.620	0.873
			(1.218)	(1.281)
Baseline dept. avg. science score (z-scores)			4.325***	3.715**
			(1.636)	(1.509)
Baseline dept. avg. CT score (z-scores)			0.060	0.242
			(1.047)	(1.030)
Baseline dept. avg. QL score (z-scores)			-0.457	-0.337
			(0.993)	(1.005)
Elite college (=1				1.138
				(1.680)
Private college (= 1)				-0.047
				(0.844)
Age of college (years)				-0.011
				(0.022)
Observations	4,619	4,582	4,556	4,556
R-squared	0.007	0.243	0.268	0.269

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 4 – PERFORMANCE MANAGEMENT AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN THE LAST THREE YEARS)

	(1)	(2)	(3)	(4)
Management (z-score)	0.564	0.392	0.649**	0.657**
	(0.470)	(0.293)	(0.266)	(0.263)
Assistant Professor (= 1)		1.230***	2.656***	2.773***
		(0.386)	(0.615)	(0.650)
Associate Professor (= 1)		2.470**	4.887***	5.088***
		(0.961)	(0.934)	(0.983)
Full Professor (= 1)		8.058***	11.541***	11.819***
		(1.796)	(1.916)	(1.912)
Age (years)		0.092	0.045	0.051
		(0.067)	(0.058)	(0.061)
Full-time (= 1)		0.783	1.269**	1.336**
		(0.574)	(0.575)	(0.594)
Female (= 1)		-0.929**	-0.693*	-0.603
		(0.420)	(0.379)	(0.386)
In process of obtaining PhD (= 1)		3.528***	2.807***	2.783***
		(0.399)	(0.407)	(0.409)
Obtained PhD (= 1)		13.684***	10.895***	10.688***
		(1.004)	(0.867)	(0.891)
Computer Science (= 1)			-0.295	-0.294
			(0.472)	(0.476)
# of students in department			-0.002	-0.002
			(0.001)	(0.001)
Department student faculty ratio			-0.022*	-0.021*
			(0.011)	(0.011)
Baseline dept. avg. math score (z-scores)			0.686	0.830
			(1.214)	(1.285)
Baseline dept. avg. science score (z-scores)			3.891**	3.416**
			(1.585)	(1.483)
Baseline dept. avg. CT score (z-scores)			0.138	0.275
			(1.070)	(1.038)
Baseline dept. avg. QL score (z-scores)			-0.115	-0.164
			(1.009)	(1.006)
Elite college (=1				1.153
				(1.662)
Private college (= 1)				-0.530
				(0.878)
Age of college (years)				-0.010
				(0.022)
Observations	4,619	4,582	4,556	4,556
R-squared	0.001	0.242	0.268	0.268

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 5 –PERSONNEL MANAGEMENT AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN THE LAST THREE YEARS)

	(1)	(2)	(3)	(4)
Management (z-score)	0.105	0.221	0.370	0.313
	(0.503)	(0.354)	(0.292)	(0.295)
Assistant Professor (= 1)		1.312***	2.713***	2.803***
		(0.403)	(0.618)	(0.652)
Associate Professor (= 1)		2.585***	4.963***	5.093***
		(0.971)	(0.940)	(0.986)
Full Professor (= 1)		8.180***	11.591***	11.777***
		(1.785)	(1.907)	(1.909)
Age (years)		0.091	0.046	0.055
		(0.068)	(0.059)	(0.061)
Full-time (= 1)		0.904	1.414**	1.406**
		(0.572)	(0.572)	(0.591)
Female (= 1)		-0.915**	-0.682*	-0.600
		(0.419)	(0.380)	(0.388)
In process of obtaining PhD (= 1)		3.531***	2.827***	2.808***
		(0.400)	(0.408)	(0.410)
Obtained PhD (= 1)		13.677***	10.951***	10.780***
		(1.008)	(0.858)	(0.892)
Computer Science (= 1)			-0.240	-0.234
			(0.467)	(0.470)
# of students in department			-0.002	-0.001
			(0.001)	(0.001)
Department student faculty ratio			-0.022*	-0.022*
			(0.011)	(0.012)
Baseline dept. avg. math score (z-scores)			0.731	0.926
			(1.226)	(1.291)
Baseline dept. avg. science score (z-scores)			3.999**	3.365**
			(1.608)	(1.489)
Baseline dept. avg. CT score (z-scores)			0.234	0.356
			(1.095)	(1.059)
Baseline dept. avg. QL score (z-scores)			-0.384	-0.345
			(0.984)	(1.018)
Elite college (=1				1.452
				(1.657)
Private college (= 1)				-0.128
				(0.959)
Age of college (years)				-0.007
				(0.023)
Observations	4,619	4,582	4,556	4,556
R-squared	0.000	0.242	0.267	0.268

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 6 – MANAGEMENT DISCRETION AND FACULTY RESEARCH PRODUCTIVITY (NUMBER OF PUBLICATIONS IN THE LAST THREE YEARS)

	(1)	(2)	(3)	(4)
Management (z-score)	2.087***	0.724**	0.400	0.313
	(0.581)	(0.345)	(0.287)	(0.267)
Assistant Professor (= 1)		1.338***	2.738***	2.796***
		(0.391)	(0.616)	(0.654)
Associate Professor (= 1)		2.643***	5.007***	5.069***
		(0.902)	(0.932)	(0.991)
Full Professor (= 1)		8.357***	11.702***	11.778***
		(1.732)	(1.923)	(1.917)
Age (years)		0.090	0.043	0.054
		(0.066)	(0.058)	(0.061)
Full-time (= 1)		0.844	1.459***	1.379**
		(0.558)	(0.553)	(0.590)
Female (= 1)		-0.895**	-0.656*	-0.588
		(0.415)	(0.381)	(0.388)
In process of obtaining PhD (= 1)		3.404***	2.789***	2.794***
		(0.403)	(0.408)	(0.408)
Obtained PhD (= 1)		13.330***	10.855***	10.751***
		(0.935)	(0.845)	(0.877)
Computer Science (= 1)			-0.230	-0.231
			(0.468)	(0.472)
# of students in department			-0.001	-0.001
			(0.001)	(0.001)
Department student faculty ratio			-0.025**	-0.024**
			(0.011)	(0.011)
Baseline dept. avg. math score (z-scores)			0.723	0.950
			(1.254)	(1.300)
Baseline dept. avg. science score (z-scores)			4.067**	3.387**
			(1.635)	(1.507)
Baseline dept. avg. CT score (z-scores)			0.257	0.378
			(1.078)	(1.048)
Baseline dept. avg. QL score (z-scores)			-0.599	-0.439
			(1.043)	(1.057)
Elite college (=1				1.410
				(1.681)
Private college (= 1)				0.139
				(0.870)
Age of college (years)				-0.006
				(0.023)
Observations	4,619	4,582	4,556	4,556
R-squared	0.017	0.243	0.267	0.268

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 7 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICES ON STUDENT MATH SKILLS

	(1)	(2)	(3)
Management (z-score)	0.022	0.016	0.005
	(0.024)	(0.024)	(0.016)
Baseline math score (z-score)	0.552***	0.555***	0.383***
	(0.031)	(0.029)	(0.020)
Female (= 1)		0.013	0.085***
		(0.026)	(0.025)
Middle wealth tercile (= 1)		0.116***	0.088***
		(0.029)	(0.026)
Highest wealth tercile (= 1)		0.075**	-0.000
		(0.036)	(0.030)
Computer Science (= 1, otherwise = 0)			-0.134***
			(0.028)
# of students in department			0.000
			(0.000)
Student-faculty ratio			-0.000
			(0.001)
Baseline dept. avg. math score (z-scores)			0.327***
			(0.103)
Baseline dept. avg. science score (z-scores)			0.002
			(0.116)
Baseline dept. avg. CT score (z-scores)			0.015
			(0.075)
Baseline dept. avg. QL score (z-scores)			0.079
			(0.069)
Elite college (= 1)			0.097
			(0.111)
Private college (= 1)			-0.073
			(0.054)
Age of college (years)			-0.000
			(0.001)
Observations	7,587	7,484	7,482
R-squared	0.303	0.310	0.367

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 8 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICES ON STUDENT SCIENCE SKILLS

	(1)	(2)	(3)
Management (z-score)	-0.010	-0.012	-0.021
	(0.022)	(0.021)	(0.018)
Baseline science score (z-score)	0.558***	0.551***	0.393***
	(0.036)	(0.035)	(0.030)
Female (= 1)		-0.091***	-0.047**
		(0.023)	(0.021)
Middle wealth tercile (= 1)		0.045*	0.037
		(0.025)	(0.024)
Highest wealth tercile (= 1)		0.038	0.014
		(0.028)	(0.024)
Computer Science (= 1, otherwise = 0)			-0.144***
			(0.025)
# of students in department			-0.000
			(0.000)
Student-faculty ratio			-0.001**
			(0.000)
Baseline dept. avg. math score (z-scores)			0.217**
			(0.090)
Baseline dept. avg. science score (z-scores)			0.130
			(0.094)
Baseline dept. avg. CT score (z-scores)			-0.033
			(0.057)
Baseline dept. avg. QL score (z-scores)			0.013
			(0.052)
Elite college (= 1)			0.138
			(0.090)
Private college (= 1)			-0.018
			(0.047)
Age of college (years)			0.000
			(0.001)
Observations	7,573	7,475	7,473
R-squared	0.298	0.305	0.344

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 9 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICES ON STUDENT CRITICAL THINKING SKILLS

	(1)	(2)	(3)
Management (z-score)	0.041	0.034	0.032
	(0.026)	(0.026)	(0.024)
Baseline CT score (z-score)	0.583***	0.548***	0.468***
	(0.031)	(0.029)	(0.026)
Female (= 1)		0.003	0.078**
		(0.031)	(0.030)
Middle wealth tercile (= 1)		0.172***	0.148***
		(0.032)	(0.032)
Highest wealth tercile (= 1)		0.294***	0.250***
		(0.035)	(0.034)
Computer Science (= 1, otherwise = 0)			-0.029
			(0.037)
# of students in department			-0.000**
			(0.000)
Student-faculty ratio			-0.001**
			(0.001)
Baseline dept. avg. math score (z-scores)			0.203
			(0.123)
Baseline dept. avg. science score (z-scores)			-0.041
			(0.134)
Baseline dept. avg. CT score (z-scores)			0.019
			(0.078)
Baseline dept. avg. QL score (z-scores)			0.205***
			(0.077)
Elite college (= 1)			-0.056
			(0.112)
Private college (= 1)			0.071
			(0.071)
Age of college (years)			-0.001
			(0.001)
Observations	3,768	3,712	3,709
R-squared	0.340	0.362	0.391

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

APPENDIX TABLE 10 – VALUE-ADDED ESTIMATES OF MANAGEMENT PRACTICES ON STUDENT QUANTITATIVE LITERACY

	(1)	(2)	(3)
Management (z-score)	0.019	0.016	0.027
	(0.018)	(0.017)	(0.019)
Baseline QL score (z-score)	0.794***	0.785***	0.695***
	(0.027)	(0.025)	(0.024)
Female (= 1)		-0.071***	-0.058***
		(0.022)	(0.022)
Middle wealth tercile (= 1)		0.082***	0.090***
		(0.023)	(0.024)
Highest wealth tercile (= 1)		0.036	0.033
		(0.031)	(0.030)
Computer Science (= 1, otherwise = 0)			-0.036
			(0.026)
# of students in department			-0.000
			(0.000)
Student-faculty ratio			-0.001
			(0.000)
Baseline dept. avg. math score (z-scores)			0.213**
			(0.091)
Baseline dept. avg. science score (z-scores)			-0.116
			(0.110)
Baseline dept. avg. CT score (z-scores)			-0.027
			(0.059)
Baseline dept. avg. QL score (z-scores)			0.178**
			(0.073)
Elite college (= 1)			-0.145
			(0.105)
Private college (= 1)			-0.027
			(0.053)
Age of college (years)			-0.001
			(0.001)
Observations	3,684	3,628	3,628
R-squared	0.638	0.647	0.658

Notes: Standard errors, reported in parentheses, are adjusted for clustering at the college level. *** p< 0.01, ** p<0.05, * p<0.1. CT = critical thinking, QL = quantitative literacy.

Appendix B: Management Practice Sub-Categories and Survey Questionnaire

B1. Management Practice Sub-categories

<u>(1) Goal Management (Targets)</u>

Q1. *Target Clarity*: There are meaningful targets for the department.

Q2. *Target Horizon:* The department has adopted short-term targets that enable it to pursue long-term goals.

Q3. *Target Stretch:* The department's targets are appropriately difficult to achieve.

Q5. *Target Inter-Connection*: The department's targets are consistent with the broader goals of the university or college.

Q6. *Target Awareness:* Individual faculty are aware of the department's targets.

Q7. *Target Performance:* The department tracks its progress toward its targets.

Q23. *Attracting Talent III*: The department has a clearly identifiable value proposition that it can offer to its faculty.

<u>(2) Performance Management (Monitoring and Operations)</u>

Q8. *Performance Review*: The department measures individual faculty performance.

Q12. *Performance Dialogue*: There are processes in place for individual faculty to learn about their individual performance.

Q21. *Attracting Talent:* The department is able to identify and hire faculty members.

Q22. *Attracting Talent II:* The department is able to recruit senior faculty from other colleges and universities.

<u>(3) Personnel Management (Incentives)</u>

Q11. *Rewarding High Performers*: The department rewards superlative individual faculty performance.

Q13. *Consequence Management*: The department has processes in place for faculty under-performance.

Q14. *Removing Poor Performers:* Underachieving faculty can be removed from their positions.

Q15. *Promoting High Performers:* Faculty are promoted using a mix of qualitative and quantitative metrics.

Q16. *Promoting High Performers II:* Certain performance criteria must be met before a faculty member can be promoted.

Q17. *Promoting High Performers III*: A high-achieving faculty member will be promoted faster than a low-achieving faculty member.

Q18. *Retaining Talent:* The department is able to offer incentives to retain high-achieving faculty members.

<u>(4) Discretion</u>

Q24. *Teaching Discretion:* Faculty have broad leeway to teach the courses that they want to teach, employing the pedagogical strategies that they think are the most appropriate.

Q25. *Research Discretion*: Faculty can set their own research agendas.

Q27. *Continuous Improvement:* Faculty can substantially contribute to determining department policies.

B2: Survey Questionnaire

MODULE 1	
START TIME:	
END TIME:	

- **Introduction Checklist**

  - Introduce yourself
  - Confirm whether person on call is HOD
  - Introduce colleague
  - Small talk (How are you? or How is your day coming along?)
  - Thank them for taking the time and participating in the process
  - Set up context for call - Understanding management practices in their department
  - Mention that this is purely for research purposes
    - Information will remain confidential
    - Call is not being recorded
  - Call time: 45 mins
  - Ask if they have any questions
  - Final prompt: Shall we get started?

- **Introduction Checklist**

  - Tell them that that was all that you wanted to know.
  - Ask if they have any questions
  - Again, thank them for their time and participating in the process

- **Overall Scores**

Section 1: Goal Management	1	1.5	2	2.5	3	3.5	4	4.5	5
Sections 2: Performance Management	1	1.5	2	2.5	3	3.5	4	4.5	5
Section 3: Talent Management	1	1.5	2	2.5	3	3.5	4	4.5	5
Section 4: Lean Management	1	1.5	2	2.5	3	3.5	4	4.5	5

- ## Section 1: Goal Management

Enumerator states: Thank you. I'd like to begin by asking about how your department develops and manages its goals. We are asking about department goals, not individual faculty goals or larger school/university goals.

- **Enumerator note:** Additional codes – 900 = Don't know, 998 = Refused to answer.

<table>
<tr><td rowspan="2">Q1</td><td rowspan="2">(Goals) Tell us about your department's goals. Does your department have a set of specific goals or objectives?

<u>Suggested prompts</u>:
We are asking about department goals, not individual faculty goals or larger school/university goals.
Does your department keep track of its enrolment, rankings, graduation rates, graduates' placement in the workforce, graduates' enrolment into a senior (master or doctoral) graduate study program, overall publication performance, or staff recruitment?</td><td rowspan="2"></td><td>1……….….1.5………
…..2</td><td>2.5………….3…………
.3.5</td><td>4……….4.5…………
…5</td></tr>
<tr><td>Score 1: The department's goals are very loosely defined or not defined at all; if they exist, they are rarely used to determine the department's work schedule; activities are based on ad hoc directives from senior management.</td><td>Score 3: Goals are defined for the department. However, their use is relatively ad hoc and many of the department's activities do not relate to those goals.</td><td>Score 5: Goals are defined for the department and they provide a clear guide to the department and its faculty as to what the department should do. They are frequently discussed and used to benchmark performance.</td></tr>
<tr><td rowspan="2">Q2</td><td rowspan="2">(Time Horizon of Goals, depends on Q1) What kinds of time scale (weeks, months, years) do these goals cover?

<u>Suggested prompts</u>:
Does your department have short and long term goals?
(Ask if they mention both short term and long term goals) To what extent are the long term and short term goals linked together?
(Short term - academic cycle or up to 1 year. Long term - overall strategy and can be 5 years, 10 years etc.)</td><td rowspan="2"></td><td>1……….….1.5………
…..2</td><td>2.5………….3…………
.3.5</td><td>4……….4.5…………
…5</td></tr>
<tr><td>Score 1: The only focus is on short-term goals based on the current regulatory cycle. There are no long-term goals (or the organisation is prepared to miss long-term goals in order to achieve short-term ones).</td><td>Score 3: There are short and long term goals for all levels of the organisation. But the goals do not link well together and the organisation does not have a coherent strategy in terms of trading off short-term and long-term goals.</td><td>Score 5: The organisation has clear long-term goals that are translated into specific short term targets so that short term goals become a 'staircase' to reach long term goals.</td></tr>
<tr><td rowspan="2">Q3</td><td rowspan="2">(Goal Stretch, depends on Q1) How tough are the goals for your department?

<u>Suggested prompts</u>:
Do you find it difficult to achieve these goals?</td><td rowspan="2"></td><td>1……….….1.5………
…..2</td><td>2.5………….3…………
.3.5</td><td>4……….4.5…………
…5</td></tr>
<tr><td>Score 1: Goals are either too easy or impossible to achieve.</td><td>Score 3: Goals are aggressive—but not impossible—and the department fails to meet them.</td><td>Score 5: Goals are genuinely demanding and are met regularly.</td></tr>
</table>

	• On average, how often would you say that you meet your goals?				
Q4 a	(Goal Balance, depending on Q1 and Q2) **Who sets the department's goals?** <u>Suggested prompts</u>: • Are goals set by university administration, school administration or your department? • Are goals determined by outside regulatory bodies like AICTE or UGC?		1…………..1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: All goals are set by outside (non-university) regulatory body like AICTE/UGC. Score 2: As well as goals set by the regulator, there are other internal (university or college level) goals as well.	Score 3: As well as goals set by outside management bodies, there are other internal (university or college level) goals as well.	Score 4: Goals are set by university or college administrators, not the department Score 5: Goals are mostly set by the department.
Q4 b	**Please rank which groups determine the department's goals**: <u>Suggested prompts</u>: • Mention the possibilities, don't simply read them aloud.		Central Government: ____ Local Government: ____ Outside Management Body: ____ Senior University or College Administrators: ____ Senior School Administrators: ____ Department: ____ Other (specify): ____ (Please indicate in the comments section the government bodies and others that the interviewee identifies. If the group is not mentioned, rank it 0)		
Q5	(Goal inter-connection) **How do the department's goals relate to goals at the university or college level?** <u>Suggested prompts</u>: • Are goals set uniformly for different departments/ faculties? • Do you have the flexibility to adapt goals to make them appropriate to your department? • If there are centrally-set goals, can you set additional (supplementary) department level goals		1…………..1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: Goals do not cascade down the organisation. Departments may set goals, but these are done on a purely ad hoc basis.	Score 3: Goals do cascade, but there may be a concern that they are imposed too rigorously. Individual departments may set additional targets, but these do not link well to central goals.	Score 5: There is a cascading of goals but the centre recognizes varying individual needs of departments. Departments may have some autonomy to set their own goals, but this is done within an overarching framework.
Q6	(Clarity and Comparability of Goals, depends on Q1) **If I**		1…………..1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5

	asked a faculty member about your department's goals, what would he or she tell me? Suggested prompts: • Could everyone in the department say what they are responsible for?		Score 1: No. There is a general level of confusion as to what the department is trying to achieve on a daily basis and what individual's roles are towards those goals.	Score 3: The department's main goals and individual's roles to achieve them are relatively clear, but it is sometimes difficult to see how current activities are moving us towards those.	Score 5: Yes. It is always clear to the body of faculty what the department is aiming to achieve with the days activities and what individual's roles and responsibilities are towards that.
Q7	(Performance Tracking – if this question is answered earlier, don't ask it) **In which ways does your department track how well it is performing?** Suggested prompts**:** • Do you use any indicators to track performance? • Can you give me an example? • How frequently do you review such performance? • Who participates in reviewing performance?		1……….….1.5……… …..2 Score 1: Measures tracked are not appropriate or do not indicate directly if overall objectives are being met. Tracking is an **ad hoc** process and most processes aren't tracked at all. Tracking is dominated by the head of the department.	2.5………..….3……… …..3.5 Score 3: Performance indicators have been specified but may not be relevant to the department's objectives. The department has **inclusive faculty meetings,** where faculty discuss how they are doing as a department.	4……….…4.5………… …5 Score 5: Performance is **continuously tracked**, both formally with key performance indicators and informally, using appropriate indicators and including many of the departmental faculty.

- ## Section 2: Performance Management

Enumerator states: Thank you. Perhaps we can discuss how you monitor progress **of faculty within your department**? Again we are interested in what really happens, rather than what the formal rules stipulate.

- **Enumerator note:** Additional codes – 900 = Don't know, 998 = Refused to answer.

Q8	(Performance Review) **Do you measure faculty performance in any way?** Suggested prompts**:** • What aspects of performance are reviewed (student evaluations on teaching, research outputs)? • How frequently do you measure faculty performance?		1……….….1.5……… …..2 Score 1: Faculty performance is not measured or is measured infrequently.	2.5………….3………… .3.5 Score 3: Performance is measured periodically with both successes and failures identified.	4……….…4.5………… …5 Score 5: Performance is continually measured, based on the indicators tracked. All aspects are measured to ensure continuous improvement.

Q9	**Q9a. Does your faculty performance measure focus on teaching, research or administrative duties?** **Q9b. What is the divide between teaching, research and administrative duties?**		Teaching: ___ Research: ___ Administrative Duties: ___ Teaching _____ % , Research _____% , Administrative Duties _____%		
Q10	**What is included in your measures of faculty performance?** (Ideally the respondent will have already mentioned some of these)		Tick boxes including: **-Teaching:** Student Evaluations ___ Exam Performance ___ Teaching Hours ___ Others ___ **-Research:** Research Funding ___ Publications ___ Others ___ -**Administrative Responsibilities**: ___ **-Peer Evaluations: ___** -Other:		
Q11	(Rewarding High Performers) **How are faculty members rewarded for good performance?** <u>Suggested prompts</u>: • Rewards, for example, can take different forms: regular financial incentives and promotions. • Are the criteria for receiving rewards clear? • How are rewards linked to performance? • (Ask if there is no formal reward mechanism) Are there informal means of rewarding faculty members for good performance?		1…………..1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: Faculty are rewarded (or not rewarded) in the same way irrespective of their performance.	Score 3: The performance evaluation system awards good performance in principle (financially **OR** non-financially), but awards are not based on clear criteria/processes.	Score 5: The evaluation system rewards individuals (financially **AND** non-financially) based on performance. Rewards are given as a consequence of well-defined and monitored individual achievements.
Q12	(Performance Dialogue, Depends on Q9) **Do individual**		1…………..1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5

	faculty have performance review meetings? <u>Suggested prompts</u>: • Who is involved in these meetings? • How are these meetings structured? • What is said/done at these meetings? • When a problem is discussed during these meetings, how do you identify the root cause of the problem?		Score 1: There are no performance review meetings. Score 2: The right information for a constructive discussion is often not present or the quality is too low; conversations focus overly on data that is not meaningful. Clear agenda is not known and purpose is not explicit. Next steps are not clearly defined.	Score 3: Review conversations are held with the appropriate data present. Objectives of meetings are clear to all participating and a clear agenda is present. Conversations do not, drive to the root causes of the problems, next steps are not well defined	Score 5: Regular review/performance conversations focus on problem solving and addressing root causes. Purpose, agenda and follow-up steps are clear to all. Meetings are an opportunity for constructive feedback and coaching.
Q13	(Consequence Management) **Given past experience, how has your department typically tolerated under-performance?** <u>Suggested prompts</u>: • Can you give me an example of how an underperforming case was dealt with? • Are there informal means of dealing with poor performance?		1………….…1.5……… …..2	2.5…………3……….. .3.5	4……….4.5………… …5
			Score 1: Poor performance is not addressed or is inconsistently addressed. Poor performers **rarely suffer consequences** or are removed from their positions.	Score 3: Poor performance is addressed, but on an **ad hoc basis**. Use of intermediate interventions, such as training, is inconsistent. Poor performers are sometimes removed from their positions under conditions of repeated poor performance.	Score 5: Repeated poor performance is **systematically addressed**, beginning with targeted intermediate interventions. Persistently poor performers are moved to less critical roles or out of the organisation.
Q14	(Removing poor performers) **Is it possible to demote or fire a faculty member?** <u>Suggested prompts</u>: • How often has a faculty member been asked to leave removed from his or her position?		1………….…1.5……… …..2	2.5…………3……….. .3.5	4……….4.5………… …5
			Score 1: Poor performers are never removed from their positions.	Score 3: Poor performers are sometimes removed from their positions.	Score 5: Poor performers are fired/demoted promptly.

- ## Section 3: Talent Management

Enumerator states: Thank you. I would now like to hear about how you attract and retain faculty. Please remember that we are interested in practices within your department rather than the university as a whole.

- **Enumerator note:** Additional codes – 900 = Don't know, 998 = Refused to answer.

Q15	(Promoting High Performers) **Is promotion based on quantitative metrics or qualitative metrics?**		1………….…1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: Faculty are promoted only using qualitative metrics.	Score 3: Faculty are promoted only using quantitative/objective metrics.	Score 5: Faculty are promoted using a mix of quantitative metrics as well as qualitative metrics.
Q16	(Promoting High Performers) **Is promotion automatic after a certain period of time or must certain performance criteria be met?** <u>Suggested prompt</u>: • Is performance based on seniority basis? • Do faculty members need to spend a minimum number of years in service before they are promoted?		1………….…1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: Faculty are promoted primarily on the basis of length of service. Job performance matters very little, if at all. Score 2: Faculty are promoted based on the criteria of having spent a minimum amount of time in service and having a decent (average) level of performance.	Score 3: Faculty are promoted on a mix of length of service and performance.	Score 5: Faculty are promoted primarily on the basis of their performance.
Q17	(Promoting High Performers) **If two faculty joined your department five years ago and one was much better than the other, would he/she be promoted through the service faster?** <u>Suggested prompts</u>: • Do poor performers get promoted slower? • Do high performers get put in positions with more responsibility?		1………….…1.5……… …..2	2.5…………3………… .3.5	4……….4.5………… …5
			Score 1: The department promotes people by length of careers only, and thus performance does not play a role in promotion.	Score 3: There is some scope for high performers to move up through the service faster than non-performers in this department, but the process is gradual and vulnerable to inefficiencies.	Score 5: The department would certainly promote the high-performer faster, and would rapidly move them to a senior position to capitalise on their skills.

Q18	(Retaining Talent) **If there is a top-performing faculty member who wants to leave, would the department make any attempt to persuade them to stay?** Suggested prompts: • Can the department increase the person's pay or reduce the person's teaching load? • What could be done informally to make it more attractive for them to stay? • How frequently do top-performing faculty think about moving?		1…….…..1.5……… …..2	2.5…………3……….. .3.5	4……..…4.5………… …5
			Score 1: We do little to try to retain our top talent	Score 3: We usually try to keep our top talent.	Score 5: We do whatever it takes to keep our top talent.
Q19	(Recruiting Talent) **Could you please tell us how many applicants you get for each open junior faculty position, on average?**		#		
Q20	(Recruiting Talent) **Q20a. Do you use committees to help make decisions about hiring junior faculty?** **Q20b. What is the typical composition of such a committee in terms of academics in your department, academics outside your department but in your university, academics outside your university, and non-academics?**		Q20a. Yes/No/Don't know/Refused to answer (*Mention the number of people in each category below*) Academics from your department: ___ Academics from outside your department: ___ Academics from outside your institution: ___ Non-Academics: ___ (If department has different types of committees for hiring different types of junior faculty – temporary (ad hoc) and permanent positions – only take into account permanent junior faculty)		
Q21	(Attracting Talent) **How involved do you get in recruiting faculty to your department?** Suggested prompts: • Does the department play a central role in selecting faculty or is it through some other process? • How many of your department's current faculty members were based on the department's recommendations?		1…….…..1.5……… …..2	2.5…………3……….. .3.5	4……..…4.5………… …5
			Score 1: The department is not involved or is minimally involved in hiring decisions for all faculty. Score 2: The department has some involvement in hiring decisions, but only for junior faculty or for temporary (ad hoc) positions.	Score 3: The department is involved in hiring decisions for all types of faculty members.	Score 4: The department plays a determinative role in hiring decisions for junior faculty or for temporary (ad hoc) positions, and has some involvement for hiring for permanent positions. Score 5: The department plays a determinative role in hiring decisions for all types of faculty members.

Q22	(Attracting Talent) **Do you try to hire or attract senior faculty from other colleges or universities?**		1………….1.5………….2	2.5………….3………….3.5	4……….4.5…………5
			Score 1: No.	Score 3: Sometimes.	Score 5: Yes, we are constantly striving to poach other faculty.
Q23	(Attracting Talent) **What makes it unique to work in your department as opposed to in a department at another institution?** <u>Suggested prompts</u>: • What kinds of incentives can you use to hire good people? • To help with hiring, can you offer extra salary? Better research facilities? Lighter teaching load?		1………….1.5………….2	2.5………….3………….3.5	4……….4.5…………5
			Score 1: Either unable to explain what is unique or competitors offer stronger reasons for talented people to join their departments.	Score 3: The value proposition to joining their department is comparable to those offered by other departments.	Score 5: Department's unique value proposition is clear and widely understood.

- ## Section 4: Lean Management

Enumerator states: Thank you. Perhaps we can discuss how you encourage research and teaching? Again we are interested in **what really happens**, rather than what the formal rules stipulate.

- **Enumerator note:** Additional codes – 900 = Don't know, 998 = Refused to answer.

Q24	**How do faculty go about teaching their courses?** <u>Suggested prompts</u>: • Can they set their own curriculum and assign their own course material? • Can they design a new class on their own?		1………….1.5…………..2	2.5………….3………….3.5	4……….4.5……………5
			Score 1: Faculty have no real independence over how they decide to carry out their teaching. Their activities are defined in detail.	Score 3: Faculty have some independence as to how they carry out their teaching, but receive strong guidance from outside.	Score 5: Faculty have a lot of independence as to how they go about their teaching work.

	• Can they grade students?				
Q25	**How do faculty go about doing their research work?** <u>Suggested prompts</u>: • Can faculty choose their own research topics or do they first require approval? • Can they hire the support staff that they want? • Can they present their work anywhere they choose?		1………..…1.5…………..2	2.5…………3…………3.5	4……..….4.5……………5
			Score 1: Faculty have no real independence to make decisions over how they carry out their research. Their research agenda is rigidly defined by someone else.	Score 3: Faculty have some independence as to how they carry out their research work, but also receive strong guidance from outside.	Score 5: Faculty have a lot of independence as to how they go about their research work.
Q26	(Research Standardization of processes) **Can you briefly outline what processes you have in place for facilitating the development of ideas into published research?** <u>Suggested prompts</u>**:** • Can faculty apply for internal research grant money? • Are there regular research seminars?		1………..…1.5…………..2	2.5…………3…………3.5	4……..….4.5……………5
			Score 1: No research processes.	Score 3: Processes in place, but they are not well-structured.	Score 5: Processes are clearly defined and well-structured.
Q27	(Continuous Improvement) **Can faculty in your department substantially contribute to changing department policies?** <u>Suggested prompts</u>: • Is there a system for faculty to identify better		1………..…1.5…………..2	2.5…………3…………3.5	4……..….4.5……………5
			Score 1: Faculty do not have channels to make substantive contributions to organisational policies, nor to the management of their implementation.	Score 3: Substantive contributions can be made in faculty meetings by all senior faculty but there are no individual channels for ideas to flow up the organisation.	Score 5: It is integral to the organisation's culture that any member of senior faculty can substantively contribute to the policies of the organisation or their implementation.

	ways of doing things? • Do you have faculty meetings where these ideas are discussed?				
Q28	(Depends on Q27) **Do you hold regular faculty meetings?**		Yes/No/Don't Know/Refused to Answer How regular?		