Strategy and Structured Management[1]

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June 2020

Extended Abstract

JEL Codes: L2, M2, O14, O32, O33

Keywords: management practices, structured management, efficiency-flexibility trade-off, strategic position, strategic commitment, internal fit, product-process matrix

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[1] *Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. CBDRB-FY19-CMS-7727.*

A long-standing management literature has explored the relationship between firm performance and human-resource and operational practices such as high performance work systems (HPWS) and lean production.[2] Recent improvements in the measurement of related "structured" management in large samples and across countries (Bloom and Van Reenen, 2007; Bloom, Sadun, and Van Reenen, 2017; Buffington et al. 2017) have fueled a resurgence in the topic, particularly among economists (Bloom et al., 2013; McKenzie and Woodruff, 2017; Giorcelli, 2019; Blader et al., 2019; Bloom et al., 2018; Bloom et al., 2019). Structured management is argued to be a best practice (Bloom, Sadun, and Van Reenen, 2017) and a source of persistent performance advantage (Sadun, Bloom, and Van Reenen, 2017). In response, statistical agencies and development initiatives in over a dozen countries have been launching initiatives to measure and promote structured management practices around the world.[3] Yet, a critical open question persists: if these "best practices" are so effective, why is there so much variation in their adoption?

Insights from strategic management –which focuses on variation among firms—provide a partial answer and lend critical insights to this fast-growing area of research and practice. The strategy cannon has long emphasized the importance of staking out a distinct market position enabled by well-aligned practices and activities that are difficult to imitate (Porter, 1996; Barney, 1991; Rivkin, 2000; Porter and Siggelkow, 2008; Leiblein et al., 2018). This suggests a more-nuanced and contingent view, in which there may be bounds on the returns from structured management practices. However, the empirical evidence to date fails to identify an inflection point where returns to structured management diminish. The current literature also has yet to take seriously the argument that important strategic choices should drive variation in both the adoption and the performance of structured management practices across firms.

Here, we confirm this intuition with rare large-scale evidence for contingencies affecting the adoption and returns to structured management practices. We find that adoption and performance of structured approaches to monitoring, target setting, and incentive practices varies considerably by important dimensions of firm strategy. We further identify some potential drivers of "misfit" between firm strategy and management in economically important contexts.

Conceptual and Empirical Contribution

Strategy is a multi-dimensional construct, and thus identifying and measuring it in large samples is difficult. We make progress by focusing on the tradeoff between efficiency and flexibility in product market positioning and execution. This "paradox of administration" goes back as far as Thompson (1967) and reflects an often-binding tradeoff faced by many firms. Moreover, a firm's choice of strategy often constrains other firm choices. For instance, efficient execution often relies on investments that require a high degree of commitment and that reduce a firm's ability to

[2] See Womack and Jones (1990 & 1994), MacDuffie (1995), Becker and Huselid (1998 & 2006), Ichniowski and Shaw (1999), *inter alia.* Delery and Roumpi (2017) provide a recent summary of the strategic human resources management (SHRM) literature. A parallel stream of economics research addresses similar questions. See, e.g., Black and Lynch (1996), Ichniowski et al. (1997), Ichniowski and Shaw (2003), and Syverson (2011).
[3] Management surveys similar to the one we use are taking place or planned in Japan, Mexico, Germany, the UK, Australia, and China with several more national surveys being currently planned for the near future. See Figure 1. Other initiatives to survey or promote certain management practices have further taken place in Bangladesh, Chile, Ghana, Kenya, Mexico, Nigeria and Sri Lanka; these are detailed in Calderón et al. (2013), De La Torre et al. (2011), de Mel et al. (2014), McKenzie and Woodruff (2014 & 2017).

adjust to changes in the competitive environment (Ghemawat, 1991; Ghemawat and Costa, 1993; Menon and Yao, 2017). In particular, commitments that are firmly routinized or embodied in process characteristics– consider the physical layout and capital infrastructure of a manufacturing plant – are particularly difficult to unwind or adapt. Flexibility, likewise, entails costly commitments such as investing in options and maintaining organizational slack (Cyert and March, 1963; Trigeorgis and Reuer, 2016). Once chosen, a particular efficiency-flexibility position depends on distinct operational and human resource practices to support it, limiting the range of approaches that constitute a good fit (Hayes and Wheelwright, 1979; Safizadeh et al., 1996).

These relationships are particularly well-established and – with the right lens – particularly straightforward to observe in the manufacturing sector, where we conduct this study.[4] We make empirical headway by developing, testing, and fielding a measure of process efficiency versus flexibility as part of the U.S. Census Bureau's 2015 Management and Organizational Practice Survey (MOPS).[5] Including this measure on the MOPS allows us not only to observe this dimension of strategy at the level of production units within firms, but also to observe rich details of structured management practices and performance outcomes for approximately 30,000 establishments in the U.S. manufacturing sector in both 2015 and 2010. Response to the survey is required by law, which results in high response rates of about 75%; the survey is furthermore constructed to be representative of the entire sector. This is the largest survey of management practices to date and serves both as the basis for influential work in this area (e.g., Bloom et al. 2019) and as the template for many international data collection efforts.[6]

Our novel process strategy lens captures the degree of process (production flow) efficiency pursued as opposed to flexibility in type and diversity of products. Each plant is characterized as one of four types, in ascending (descending) order of efficiency (flexibility): job shop (including R&D and prototyping), batch production, continuous flow, and cellular manufacturing. Extensive validation of this measure indicates that it distinguishes plants along a number of dimensions as predicted in seminal work by Hayes and Wheelright (1979) and Safizadeh et al. (1996). The notion that this captures a key measure of irreversible strategic commitment (Ghemawat, 1991) is supported by an almost complete absence of reported change in this characterization of a plant's operations over the 2010-2015 period we observe.

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[4] Measurement of strategic commitments is challenging, as the related theoretical concepts, such as high asset specificity (Williamson, 1985), capital redeployment costs (Capron and Hulland, 1999) or sunk investments (Ghemawat, 1991) are hard to observe. We exploit distinct features of the manufacturing sector to make progress but expect the principles to apply to settings where these commitments may be less tangible, and therefore more difficult to observe.

[5] For more information on the development and testing of MOPS content see Buffington et al. (2017) and Buffington, Herrell, and Ohlmacher (2016). MOPS questionnaires can be found at https://www.census.gov/programs-surveys/mops/technical-documentation/questionnaires.html. The measure of production-unit strategy is question 44 on the 2015 MOPS.

[6] For more information on international efforts to collect data on the use of structured management, see https://managementresearch.com/international/

Hypotheses

Based on a rich body of prior work in this area, we predict that strategic commitments made to efficiency versus flexibility at the production unit level will have profound implications for the type of management practices that are productive in different settings. The table below summarizes some of the key differences for the extreme ends of the flexibility-efficiency continuum (job shops versus continuous flow and cellular manufacturing shops) adapted from Safizadeh et al. (1996):

Plant type	Job Shop	Continuous Flow Shop
Strategic Objective	Flexibility	Efficiency
Strategic Target	Specialty orders and niches	Industry-wide, mass-production
Degree of Structure in Management Practices	Low	High
Monitoring	Product-dependent and irregular (jumbled flow)	Continuous and regular since process is consistent
Problem-solving	Reactive and one-time fix for problem-specific production process	Proactive and continuous improvement of same production process
Number of KPIs	Low quantity of customized indicators, as process is variable	High number of customized indicators for each step within same process
KPI Review frequency	Infrequent, as most orders are fulfilled without custom KPIs, as production-process is order-specific	Frequent review of consistent tracking of same set of KPIs
KPI display	No need for visibility as production steps are not complementary	Maximize visibility, as process steps are highly complementary
Target horizon	Mostly short-term targets to fulfill given custom order	Combination or short-term and long-term targets
Target stretch	Targets can be extremely ambitious or easy to meet, depending on custom order	Consistently calibrated to "more than normal" effort, but neither too high nor too low
Target awareness	Target awareness only for subset of employees involved in a specific custom order	Maximum awareness across organizational layers, as production steps are highly complementary
Performance pay granularity	Group or establishment performance, as unavailability of KPIs and variable production processes make individual performance measures very noisy	Individual performance-based, as high number of KPIs and recurring tasks reduce noise in individual performance measures
Promotion policies	Primarily seniority-based, as individual ability/effort is hard to separate from order/product-specific issues	Primarily merit (ability or effort) based performance, since individual ability/effort can be measured well
Reassignment policies	Reassignment slow, as hard to separate individual effort from product or order-specific issues	Reassignment is quick, as individual performance measures are potentially available

Figure 1: Overview of process strategy, plant types and corresponding implications for structured management fit

Empirical Approach and Results

We empirically test whether different plant types are systematically more or less likely to adopt structured management practices as described above. We construct an index from the core MOPS questions focused on monitoring of the production process, target setting, and incentives (target-based bonuses and rapid firing of under-performing workers). We then regress this index on plant types. Table 1 shows support for our predictions: adoption of structured management is strictly increasing in the flow efficiency of the production unit, controlling for plant size and fine-grained industry categories (at the 6-digit NAICS level). Column 1 shows this for each process type; column 2 uses a continuous measure of flow efficiency across all of the plant types.

Are firms optimally aligning their management practices with their process strategy? We explore this, next, by taking an empirically-driven approach to defining a good strategy-practice fit. Leaning on the size and representativeness of our sample, we define "optimal" structured management adoption levels as those observed among the 10% most-productive plants within a narrowly-defined industry and process strategy category. We estimate misalignment using the squared deviation of a plant-level structured management score from this "optimal" level, similar to approaches by Nickerson and Silverman (2003), Bloom, Sadun, and Van Reenen (2017), and Hong et al. (2019). This measure may be theoretically derived from a second-order approximation of the performance function around the optimal structured management adoption level.

As the first column in table 2 shows, higher levels of misalignment are associated with systematically lower levels of productivity. These effects are precisely estimated, as the standard error of the misalignment term is an order of magnitude smaller than the coefficient value.

Given the evidence on the deleterious effects of incompetent management, it is critical to determine whether the overall misalignment penalty is primarily driven by under-adoption or over-adoption of structured management. The second column of table 2 provides this evidence. Here, we re-run the productivity regressions, but split up the misalignment term into one part that captures plants that have structured management below the empirically-determined optimal level, and those that are above. Strikingly, both types of misaligned plants exhibit systematically lower productivity than less-misaligned plants. In other words, more structured management is productive *up to a point,* but it may be harmful in contexts where flexibility is strategically important.

This relationship can only be empirically estimated because of apparent "mistakes" made at individual establishments. This raises important questions about how plants become misaligned in the first place. Recent work points to competition and learning spillovers as positive influences on the diffusion of management practices (Bloom et al. 2019). We find preliminary evidence for two drivers of less-positive misalignment: unionization and peer effects. We find that plants that are subject to higher unionization of workers exhibit systematically higher levels of misalignment. Further, higher average misalignment at geographically proximate plants of the same type and in the same industry predicts higher misalignment at the focal plant, consistent with boundedly rational imitation of peers (DiMaggio and Powell, 1983; Flingstein, 1985; Lieberman and Asaba, 2006). This preliminary work will be expanded to control for endogeneity in our estimates using the drivers of misalignment and conduct further robustness checks.

Our results contribute to three major strands of the literature at the intersection of management, economics, and strategy. First, we take our findings as a critical call to further understand the nuances and contingencies determining the returns to certain types of management practices. We focus on only one type of contingency, but expect that others may be uncovered with the right data collection and analysis. These findings add nuance and boundary conditions to the burgeoning work on "structured" management (Bloom and Van Reenen, 2007; Bloom et al., 2016; Bloom, Sadun, and Van Reenen, 2017; Giorcelli, 2019, Bloom et al., 2019). We believe that our findings are useful for both academic research seeking to understand the diffusion and performance implications of these practice, as well as for the statistical agencies and development organizations that are rapidly constructing their own management surveys and even promoting adoption in practice (Cirera and Maloney, 2017). In turn, practitioners considering deploying these particular approaches in their own operations will further benefit from guidance on where they are likely to be most appropriate and productive.

Second, our novel measure of process strategy and focus on strategy-practice fit contributes to the strategic management literature on commitment (e.g., Ghemawat, 1991; Menon and Yao, 2017), and the importance of alignment between human resources practices and external market considerations for firm performance (Becker and Huselid, 1998 & 2006). Of note, our new evidence on the importance of irreversible process strategy choices at the establishment level has important implications for both within-firm and firm-level adjustment costs, a topic that has received increased attention in recent years (e.g., Argyres et al., 2019; Bigelow et al., 2019).

Third, we contribute to a prominent and enduring literature in economics and strategy on the importance of contingencies and complementarities when considering an entire system of practices and investments within firms (Milgrom and Roberts, 1990 & 1995; Porter, 1996; Rivkin, 2000; Porter and Siggelkow, 2008; Siggelkow, 2011; Blader et al., 2019; Hong et al., 2019; Yang et al., 2020). Of particular interest for this literature is our analysis of potential drivers of misalignment as well as causal estimates of the performance effects of misalignment.

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Table 1: Contingent Adoption of Structured Management

	(1) Structured Management	(2) Structured Management
Batch Production	0.162***	
	(0.00905)	
Continuous Flow (excluding Cellular)	0.241***	
	(0.00960)	
Cellular Manufacturing	0.293***	
	(0.0106)	
log size	0.141***	0.141***
	(0.00370)	(0.00371)
Plant Type		0.102***
		(0.00339)
Constant	-0.773***	-0.946***
	(0.0177)	(0.0186)
Industry Fixed Effects	YES	YES
Observations	33,000	33,000
R-squared	0.274	0.273

Notes: Dependent variable is Structured Management score, defined as sum of normalized questions on monitoring, targets and incentive management from the MOPS with zero mean and unit variance. Specification (1) uses job shops and R&D plants as baseline group and has indicators for batch production, continuous flow and celluar manufacturing as main independent variables. Specification (2) combines all plant types into one variable that increases in flow efficiency of plant type. Industry fixed effects are at the 6-digit NAICS level. Standard errors are clustered at the firm level.

Table 2: Misalignment and Performance

	(1) log revenue	(2) log revenue
log capital stock	0.0826***	0.0826***
	(0.00415)	(0.00415)
log IT capital	0.00776***	0.00775***
	(0.00198)	(0.00198)
log other IT expenditure	0.00437***	0.00436***
	(0.000917)	(0.000917)
log payroll	0.875***	0.875***
	(0.00670)	(0.00670)
log materials	0.352***	0.352***
	(0.0141)	(0.0141)
Misalignment	-0.0500***	
	(0.00362)	
Misalignment: Under-adoption		-0.0507***
		(0.00371)
Misalignment: Over-adoption		-0.0350***
		(0.0135)
Constant	1.776***	1.777***
	(0.0419)	(0.0419)
Industry Fixed Effects	YES	YES
Observations	40,500	40,500
R-squared	0.872	0.872

Notes: Misalignment is calculated as squared deviation of mean adoption of Structured Management score at plants in the 90th percentile of labor productivity distribution, for plants of the same industry and the same type, see section 2. Sample only consists of plants below the 90th percentile of the labor productivity distribution. Industry fixed effects are at the 6 digit NAICS level. Standard errors are clustered at the firm level.