Trick My Routine:
Redesigning Routines for Replication

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Abstract

Chains are the dominant form of organization in the dominant sector of the economy. The primary source of value in chains is the operational routine at the outlets. Capturing the value of that routine requires large scale replication. While a prior focus in the routines literature has been replication itself, an important but overlooked issue is design of what gets replicated. This relative neglect occurs because a dominant view in the literature is that routines are enacted/discovered rather than designed. Using evidence from the literature we argue that routines ARE designed, and that the design affects not only chains’ ability to replicate routines, but also the quality and consistency of what gets replicated. Accordingly the study of design of routines for large scale replication has tremendous potential to improve the operational performance of chains. As a first step toward theory building we conduct an exploratory study of the redesign process wherein a chain was "tricking" a highly evolved routine. Since this is unanticipated by theory, we felt the tricking process was an opportunity to better understand (re)design of routines for large scale replication. The case demonstrates that the process affects the design and accordingly subsequent performance. Moreover it provides preliminary indications of likely process problems from which we might build theory.
1. Introduction

Chains/franchises comprise a large and growing share of economic activity. In the US for example, they represent 69.5% of retail and service sector sales.\(^1\) These sectors in turn comprise 52.3% of GDP, with share growth of 1.7%. This is as compared to manufacturing's share which as of 2002 was 13.9% of GDP, contracting at 4.6% annually.\(^2\) One of the main sources of performance differences across chains and of performance differences of chains relative to independent firms is the organizational routine (Knott and McKelvey 1999). However in order to exploit the inherent advantage of its routine, a chain must be able to replicate it reliably across a large number of outlets. Such replication appears to be difficult. Past studies indicate that replication problems arise from properties of the knowledge itself, properties of the organizations providing and receiving the knowledge, as well as fit between the knowledge and the organizations (Szulanski 1996, Knott 2003).

One means to ease these replication problems is through better upfront design of routines. There should be tremendous potential in the design process to affect properties of the routine as well as its fit with the organization. The most obvious means to affect properties of the routine is to codify it— translating what the executors know/do intuitively into something that is specified explicitly. An obvious means to change fit between the routine and the organization is to tailor the routine to use existing facilities, equipment, labor and practices. Both efforts (changing the properties and changing the fit) increase the fixed cost of developing a routine in exchange for lower cost of adopting the routine at each outlet. Surprisingly little work examines upfront efforts to design routines.

The work that comes closest to design of routines is Winter and Szulanski (2001) who see the “design problem” as one of discovering the Arrow core of a routine. The Arrow core is the “knowledge of which attributes are replicable and worth replicating, together with knowledge of how these attributes are created” (2001: 731). Because routines comprise a complex and causally ambiguous set of interdependent elements, Winter and Szulanski posit that knowledge of the Arrow core is discovered

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\(^1\) shares computed by author from 2002 economic census data

\(^2\) shares computed by author from data in "Gross Domestic Product by Industry", Yuskavage and Strassner (2003)
through experiential learning. Such learning takes place across a series of implementations (individual outlets) each of which reflects increasingly sound hypotheses about what the Arrow core comprises.

An alternative view recognizes that even to discover the Arrow core the firm first needs to articulate an initial routine. At a minimum it needs to decide where to locate, what customers to serve, what to offer them, at what price, with what materials and equipment, from which suppliers, with what workers and with what training. We know almost nothing about this initial design process, nor of the process for redesigning the routine for large scale replication.

Thus this paper offers an exploratory study of the redesign process. The emphasis on redesign rather than design stems from two rationale. First the scope of redesign is bounded. Rather than starting from scratch trying to understand both the scope of things to design and the set of alternatives for each element of design, the redesign process focuses only on elements worth changing. Second and more importantly the redesign process carries greater weight because a) it presupposes a valuable routine (in general only firms who achieve success in their initial location will be motivated to replicate), and b) it pays attention only to those elements of the design with the highest payoff. These are either inferior elements (mistakes) whose cost becomes magnified when aggregated across multiple outlets, or elements with complementarities (scale/scope economies) across units. Finally, it is worth noting that the redesign process will likely have insights for initial design as well.

This particular study was precipitated by an apparent anomaly wherein a chain was "tricking" a highly evolved routine. In 2000, a large chain in the quick printing/photocopying industry, decided to introduce signs and banners (S&B) as a new product line in its existing outlets. Because the chain had no expertise with this technology, they enlisted the expertise of one of the most successful single outlet S&B operations in the US. What captured our attention about this joint venture were first that the independent firm (henceforward referred to as Signs) had been successfully refining its S&B routine over twelve years by the time the chain (henceforward referred to as QPrint) engaged them. Thus if an S&B Arrow core (ideal routine) existed, surely it had discovered it. Second, despite the fact that QPrint was paying for Signs' routine, it was modifying important elements in seemingly detrimental ways. Since this is
unanticipated by theory, we felt the tricking process was an opportunity to better understand (re)design of routines for large scale replication.

While we found evidence of classic knowledge transfer problems (in this case the transfer between Signs and QPrint, rather than QPrint and the operating units), we also found problems unique to large scale replication. In particular we found that wresting decision-making with headquarters’ personnel led to systematic discounting of operational consequences at the unit level. This discounting was not due to incentive alignment problems. While the problems may reflect limited knowledge of headquarters personnel, e.g., not knowing how to make operational tradeoffs, this was true in all QPrint’s decisions regarding the S&B routine, not just the "mistakes". What is unique about the design mistakes we observed is that they had costs or benefits that were allocated to headquarters, e.g., the training system. While the headquarters costs and benefits were easily quantified, the operational consequences to units were not. In these instances the impact of the decision on local units tended to be heavily discounted.

The net result of the resulting design is that QPrint’s revenues for S&B were 80% below their original goals. This does not reflect lack of commitment by headquarters. Quite the contrary, headquarters is currently redesigning the S&B routine to more closely match Signs’ template. This result is reminiscent of the Szulanski and Jensen (2006) result with Mail Boxes Etc where the Master Licensee decided to begin copying exactly.

The contributions of this study are four-fold. First, we exploit Pentland and Feldman's (2003) distinction between the ostensive and performative aspects of routines to argue that while the performative aspects of the routine are emergent, the ostensive components can (and should) be designed, particularly in the case of large scale replication. Second, we conduct an exploratory study to determine how routines are designed in practice for large scale replication. Third, we identify a tension between headquarters and local units in that design process. Fourth, we propose "design for manufacturing" as a meaningful analog to guide "design for replication" to alleviate these tensions.
2. Routines

2.1 Definition

Nelson and Winter (1982) define routines as all regular and predictable behavioral patterns of firms. They are the organizational equivalent of individual's skills in that they provide capability for a smooth sequence of coordinated behavior (Nelson & Winter 1982). Nelson & Winter view routines as the primary source of sustained performance differences between firms: "Organizations with certain routines do better than others [in the short term], thus their relative importance in the population is augmented over time [through investment routines which are keyed to profitability]" (1982:14). This has been verified empirically in tests of differential performance of franchises and independents over time (Knott 2001).

In essence one theory of chains is that an entrepreneur initiates an organizational routine upon opening the first establishment. This entrepreneur observes over time the performance of its establishment relative to rivals in the local market. If the establishment is more successful than rivals, the entrepreneur concludes it possesses a superior organizational routine. The entrepreneur then exploits that success in other geographic markets. The exploitation stems from the reasonable expectation that the underlying distribution of routines in these other markets is similar to that of the initial market. Thus on average, the chain’s establishments will be more successful than rivals in each of these new markets. The chain has two avenues for duplicating its success in these new markets. It can either establish company-owned units (chain) or it can franchise its routine to local entrepreneurs (franchise).

2.2 Role of the Ostensive Routine

In either case (chain or franchise) realization of a superior routine is only the first step in creating a successful chain. The second and more difficult step is large scale replication of the routine. This is particularly tricky in that the literature often talks about the value of routines as stemming from their inimitability. Here it is essential that the firm be able to imitate (replicate) the routine several times over.
One wedge that potentially solves the paradox of valuable yet imitable routines (Knott 2003) is tacitness. The issue of tacitness is best illuminated by Pentland and Feldman's (2003) distinction between the ostensive and performative aspects of routines. The ostensive aspect is the schematic form of the routine; while the performative aspect consists of the routine as it is practiced. Pentland and Feldman offer a symphony as nice illustration of the distinction between the two aspects of routines: the ostensive component is the score as written by the composer (necessarily explicit), while the performative aspect is the execution by a particular orchestra (potentially tacit).

Thus the ostensive component is the structure that gives rise to the performative component. In this sense the ostensive and performative components of routines are related in a manner similar to that between the formal organization and the informal organization (Barnard 1938). The formal organization defines responsibilities, reporting relationships and incentive systems. The informal organization comprises the communication systems through which work is actually accomplished. Many organic metaphors come to mind here, but a favorite recent metaphor (January 2008) is the University of Minnesota Center for Cardiovascular Repair's ability to grow a beating heart (performative component) by seeding decellularized heart scaffolds (the ostensive component) with heart cells.

One can imagine that routines vary in the extent of specification of the ostensive component. One further expects that greater specification of the ostensive component reduces variance in the performative component. Taking the musical score as an example, variance decreases as we remove degrees of freedom (moving left to right in figure 1). At the most basic level we have the score as written by the composer. We progressively decrease degrees of freedom (and variance) by writing separate scores for each instrument, by specifying conductor, by specifying the orchestra members and by choosing their instruments. This still leaves substantial variance since each performance involves players' talent, but it is far less variance than if we provided the basic score to all members of several orchestras.

Thus while the performative aspects of routines are emergent, at least some ostensive components must be articulated. Accordingly they lend themselves to design. Moreover, the degree of specification
and the quality of specification (the design) of the ostensive component is likely to have substantial impact on what gets enacted.

2.3 Transfer of Routines

One of the chief challenges of replicating routines is their transfer across organizational boundaries. Fortunately the literature on transfer is probably the most fully developed area within that of routines—particularly when we combine it with work on knowledge transfer. A seminal piece in that literature is Argote, Beckman and Epple (1990) who examine the degree to which different shifts in a truck plant share the same learning curve. The empirics implicitly test the extent to which knowledge is embedded in technology versus held by individuals. Argote et al found that only 69% of the learning from the first shift transferred to the second shift when it was introduced. Thus even in a manufacturing setting with dedicated equipment, at least 31% of knowledge is disembodied. This 31% represents a lower bound because part of what gets transferred is the routines that labor uses when it interacts with the equipment. For service settings, almost all knowledge will be disembodied.

While Argote et al demonstrate proof of principle—that a substantial portion of manufacturing "technology" is held by individuals, other work has tackled the question of variance: what factors affect the fidelity of transfer—most notably in a chain setting. Szulanski (1996) examined the extent to which best practices diffused throughout a chain of banks. He found that properties of the source, the recipient (also examined by Zander and Kogut 1995) and the knowledge itself all affected the extent of transfer. Darr, Epple and Argote (1995) examined the extent to which learning curves are shared between members of a pizza franchise—they showed that co-ownership (a franchisee owns multiple locations) facilitates transfer. Finally, Knott (2003) tackled the resource based view (RBV) presumption that routines must be tacit to be valuable by pointing out that franchisors must sell the routines to franchisees. In examining how routines can be both transferrable as well as valuable, Knott found that firms with equal access to an ostensive routine differ in its performative aspects. This variance in the performative aspect (both use of
particular practices within the routine and achieved efficiency of the routine) stems from three factors that
differ across units: access to the routine, confidence in the routine, and mechanisms for compliance.
These results suggest that what gets labeled as incomplete knowledge transfer may indeed be something
else: organizational units with perfect incentives (owner-managers) and complete transfer of the
ostensive routine still exhibit substantial variance in the performative routine. Thus a goal of high mean
and low variance in the performative routine requires more than high fidelity transfer. In particular, we
suggest it requires better design of routines.

Having said that there are still a number of points to make with respect to transfer. First, the
performative routine achieves the inherent potential of its ostensive routine asymptotically through
learning curves. Thus transfer should consider not only the level of performance upon transfer, but the
rate of improvement toward the asymptote. One nice study that examines variance in both level and rate
is Macher and Mowery (2003). That paper characterizes variance in the cycle time of semiconductor
plants as a function of organizational practices. They find that team diversity, co-location of engineering
and manufacturing, information handling, data analysis and scheduling all exhibit lower initial
performance with a routine, but faster convergence toward the asymptote.

In a related vein, Tucker, Nembhard and Edmondsen (2007) assert that a reasonable goal of
hospital ICUs is minimizing performance variance (an alternative goal is higher mean performance, but
minimizing low end outcomes (deaths) is probably more salient in this setting). Like Knott (2003) they
find substantial variance around published “evidence-based best practice guidelines”. They propose that
impediments to standardization are heterogeneous customers (no potential for a universal routine),
disagreement about the validity of a practice, and problems changing existing behaviors. They use a
survey to determine the extent to which learn-what (distribution of articles, conference calls, literature
reviews, site visits and workbooks) versus learn-how (education sessions, feedback, dry runs, team
meetings and problem solving cycles) activities affect implementation success. They find that learn how
activities significantly increase perceived implementation success, while learn-what activities have no
effect. In an effect reminiscent of Knott (2003) they also found that higher levels of clinical evidence
(Knott's confidence in practices) significantly increased implementation success. It is worth noting that a well-designed routine should yield higher performance with lower variance, and thus provide higher levels of "clinical evidence" for future transfers. Thus low variance and enhanced compliance are mutually reinforcing.

One final point raised by Tucker et al pertains to the mode of transfer—implicitly a continuum from publishing guidelines/procedures to side-by-side training. The choice of mode is ultimately constrained by type of routine and the performance goal, e.g., there are hundreds of books on golf technique, but even Tiger Woods has a coach who works with him daily. Within type however there is still opportunity to trade greater circumscription of the ostensive routine (higher up-front cost), for easier and more reliable transfers.

One transfer mode that has received considerable attention is personnel movement (Boeker 1997, Almeida and Kogut 1999). This is probably the most expensive mode of transfer—the most notable example being Mostafa’s (2008) account of the nascent Bangladesh clothing manufacturer, Desh, sending 126 workers (1/4 of its workforce) to Korea for six months to work side-by-side with the experienced workers at Daewoo. This mode is probably not feasible for large scale replication of chains where each unit hires locally.

Nevertheless a very nice examination of transfer via personnel movement comes from a lab experiment by Kane, Argote and Levine (2005). In the experiment, teams were charged with making origami boats. All teams were given the same product specifications, but were offered training in two separate techniques: the inferior technique required twelve folds, while the superior technique required only seven folds (though the folds were more complex). Teams with the superior routine had twice the productivity (and accordingly twice the reward) of teams with the inferior technique. The experiment rotated team members between rounds and examined the extent to which inferior teams adopted the superior technique when they inherited a member with the superior technique. The experiment found that if the new member shared a superordinate identity, the team was more likely to adopt the new (superior) technique and was able to quickly achieve the same performance as teams where all members were
trained in the superior technique. While the main goal of the study was demonstrating the effects of
identity, one very important conclusion is that the performative aspect of routine is highly driven by the
level of specification and design of the ostensive routine. Here all participants had the same product
specifications (one possible definition of the ostensive routine), but their performance was driven by
training around specific techniques to achieve the product specifications (an alternative definition of
ostensive routine). The training had a profound effect on the performative routines. Teams did not
deviate from their learned technique without introduction of a new team member. Thus there is
tremendous opportunity to improve mean performance and reduce variance through specification of the
ostensive routine (a factor of two difference in this experimental example).

2.4 Source of the Ostensive Routine

Most of the aforementioned studies examining the replication process take the routine as given.
Few address designing (or re-designing) routines before replication. This is surprising given the
tremendous impact the ostensive routine has on the level and variance of the performative routine.

Discovery of routines

One exception to studies which take the routine as given is Winter and Szulanski (2001). The
authors challenge the view that replication is simple application of a well known formula. They argue
that firms must expend time and resources to learn the Arrow core of a routine (attributes/routines that are
replicable and worth replicating). In their view the firm uses a template (a working example) as a basis
for “discovering” the Arrow core. This discovery is a gradual learning process involving broad scope
knowledge transfer and dynamic capabilities at the center of the organization. Under this process the
routine that is replicated evolves over time. While Winter and Szulanski acknowledge the importance of
a correctly specified routine, the challenge in defining the routine is taken to be one of discovery rather
one of design.
While we acknowledge that some elements of performative routines are causally ambiguous and therefore resistant to ostensive design, we believe there are several elements that lend themselves to design. This is evident from the McDonald’s example of experimentation during the process of designing their second location:

“The McDonald brothers showed similar inventiveness when they designed the kitchen for the new building. It was more than twice the size of the one in San Bernardino, and the brothers wanted to be certain that its design accommodated their well-defined production system. They had a brainstorm. They drew the outline of the new kitchen on their home tennis court, and after closing one night at Fourteenth and E, they invited the night crew over to go through all the hamburger assembly motions. As the crew members moved around the court making imaginary hamburgers, shakes and fries, the brothers followed them, marking in red chalk exactly where all the kitchen equipment should be placed. By 3:00 A.M., the tennis court markup was completed; and for a fraction of the cost of conventional design work, the brothers had a detailed kitchen layout.”

This example shows that even processes that are causally ambiguous can be improved and codified. In this sense the design process can expedite Winter and Szulanski’s discovery through off-line experimentation. What the design process accomplishes is shifting the timing and extent of benefits from improving the operational routine. We attempt to capture these effects in Figure 2. Figure 2a examines the steady-state efficiency/profitability of the performative routine versus the number of replications, while Figure 2b captures the cost of implementing the routine at a given location versus the number of prior replications. Both figures suggest that the benefits of designing routines for replication are 1) transforming gradual improvement in efficiency/ adoption cost over time into earlier step function improvements, and 2) greater consistency of the routine across outlets. Both benefits are possible because all the learning from on-line experiments at real outlets over time is transformed into off-line learning up-front. While the design process precludes taking advantage of later knowledge, the benefits of that residual improvement over a small number of remaining units is dominated by early improvement over a

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large number of units. [The area between the two curves left of the crossover point in Figure 2a is greater than the area to the right].

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Limits to Discovery (The human skills equivalent)

While the link between ostensive design and performative dynamics has not garnered much attention in the routines literature, it was a central feature of an analogous literature on job skills (scientific management). What Taylor (1911) showed was that without intervention, human skills would evolve over time, but would plateau at a level well below what was possible through scientific job design. The most vivid example pertains to brick laying. Centuries of brick laying craft maintained by guilds (equivalent of enactment/discovery) had rendered a state of the art involving eighteen movements per brick, with resulting productivity of 120 bricks laid per person-hour. Time motion studies (equivalent of redesign) reduced the number of movements to five, with a corresponding THREE-fold increase in output (350 bricks per hour). This historical shift from enactment/discovery to redesign of job skills occurred for similar reasons to the historical shift motivating redesign of routines. In particular there was a shift from single craftsmen to large scale manufacturing, just as now there is a shift from independent retailers to chains. In both cases the new larger scale offers returns to up-front design not justified for the single craftsman/retailer.

One additional advantage of design versus discovery of the ostensive routine is that it reduces the requirement for existing employees to come off-line to train new employees. This occurs because the design process inherently results in codification of the ostensive routine. More importantly and more pertinent to our goals, the redesigned ostensive skill exhibits higher performance than skills evolving

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4 Note of course that most successful chains periodically update the routine to sustain competitive advantage (Knott 2001). For example, McDonald's recently introduced premium roast coffee that requires an estimated $100,000 investment per store to cover renovations and initial new equipment. The distinction between this process and discovery is that this represents innovation to an existing routine (something that becomes attractive because of changes in demand/technology) rather than something which is an inherently better approach with existing demand/technology.
strictly via performative transfers. This was true not only for Taylor, but for the origami boats in Kane et al 2005.

Design of routines

The simplest means to consider design of routines is to examine the experimental studies discussed earlier. Those experiments make two important points. The first point is that there is always some ostensive routine that has been designed by someone. Even in the very simple lab experiments, someone decided what to specify (the ostensive routine) for the subjects. In Cohen and Bacdayan (1994), it is the rules and payoffs for the card game; in Kane et al (2005), it is the product specification for the origami boats, and the two production techniques. In Winter and Szulanski (2001) it is the template.

The second and more important point is that specification of the ostensive routine has a tremendous impact on the performative routine. If teams in the boat experiment were only given the product specifications there would have been tremendous variance in the performative routines. While there would certainly be learning (performance improvement), the mean performance would likely fall well below that of the team with the superior technique. Moreover, once the boat routine became encapsulated in procedural memory (Cohen and Bacdayan 1994) subjects were unlikely to deviate from it (the very property that makes routines valuable).

What the boat experiment demonstrates is that design of the ostensive routine controls the degree and type of emergence of the performative routine. Greater circumscription (the two techniques versus the specification alone) has a tremendous effect on both mean performance (factor of two difference) and variance about that performance (limited variance around a technique, but large variance across technique). Accordingly there is tremendous payoff to designing the ostensive routine.

2.5 The Empirical Puzzle

Given the high cost to either discover or design routines, we would expect firms possessing a highly evolved routine not to deviate from it. Our study investigates a counterexample—a firm who
purchased a routine representing industry best practice, yet chose to modify it in seemingly detrimental ways while redesigning it for large scale replication. Through this case we hope to better understand design of routines. The study is exploratory in sense that there is little theory to guide the process of designing routines. In part this is because routines are often characterized as enactments that evolve through repeated execution.

One aspect of this case that is particularly helpful for analysis, but which will be true for most large scale replication, is that an ostensive design already exists. Thus rather than characterizing a design process in its entirety (an almost unbounded exercise), we can focus on deviations—those things important enough to merit deliberation/change. While the existing design is for single unit operation and thus may inherently require changes to capture potential scale economies, QPrint perceives this design to be superior to anything it could create on its own. However, despite the acknowledged superiority of the routine (Signs is one of the largest single unit operations in the country and was the firm QPrint chose over designing from scratch as well as over all other existing routines), QPrint is "tricking" the routine in seemingly detrimental ways. We believe these changes represent opportunity to better understand the Arrow Core (the "ideal" ostensive routine) as well as the process of designing routines for large scale replication.

3. Method

3.1 Research site

The setting for our research is a large chain in the quick printing/photocopying industry. The industry is largely composed of small owner-operated firms offering high speed copying, color copying, desktop publishing, bindery and other printing related services primarily for small business customers. The industry had its inception in the mid-sixties with the introduction of photographic plate-making equipment. The plate making equipment and the offset presses both required skilled labor. However in recent times, much of this commercial equipment has been displaced by digital equipment (desktop publishing and high-speed copiers). Digital equipment (including personal computers) is now so
common that most workers learn to use it as a byproduct of their education or early work experience. In essence the digital equipment has absorbed most of the skill in printing. Accordingly the industry now employs low-skilled labor.

The benefit of digital equipment has been lower labor costs from job deskilling. The disadvantage of digital equipment is that it has displaced industry sales. The diffusion of digital copy equipment throughout most offices and the diffusion of personal computers and printers (a substitute technology) in most businesses and even 61.8% of homes\(^5\), has caused same site sales for the quick-printing industry generally and QPrint in particular to decline. In response, QPrint created a central planning group (CPG) to identify opportunities for expanding sales at each outlet. Our study focuses on one of those opportunities, the introduction of signs and banners (S&B).

The signs and banners industry, like the quick printing industry comprises small owner-operated firms catering to small business customers. S&B is a newer industry (founded mid-eighties) that exploits desktop publishing and large scale plotters to create custom products such as banners, store window graphics, lawn signs, vehicle graphics, exhibits/displays and architectural signs. This industry requires substantially more skill than the quick printing industry as well as some graphic design talent. A quick check of the relative skill requirements compares the training times for franchisees in the respective industries. On average, printing franchisees receive two weeks training, while S&B franchisees receive five weeks training. If we assume one week’s training in each industry pertains to business management and marketing, then skills unique to S&B require four times the training of skills unique to printing.

Once CPG identified the S&B opportunity they sought an expert to help develop the routine for their outlets. Ultimately they contracted with Signs, one of the most successful single location S&B firms in the country. (Note, there were successful S&B chains, but for competitive reasons they would be unlikely to consult with QPrint).

QPrint and Signs form the setting for our study. This setting is both appropriate and interesting for examining the Arrow core and design of routines. This setting is appropriate first because it involves

large scale replication of a routine across the chain. The initial target for the chain was approximately 500 outlets. The setting is also appropriate because Signs S&B routine should reflect the Arrow core (the "ideal" ostensive routine that has been discovered over time). Signs had been operating successfully for twelve years at the time of the joint venture. Over this period it had operated in six locations (requiring replication of facilities), had cumulatively employed over one thousand employees (replication of skills) and had sold to large national customers and customers in all fifty states and six foreign countries (robust across contexts). Accordingly each new location, new employee and new customer reflected an opportunity to “enact and test” increasingly sound hypotheses about elements of the Arrow core. That Signs had twelve years of such experimentation and had grown to be one of the most successful S&B firms in the U.S. suggests that Signs would have a sound hypothesis about the Arrow core of its operations. It is worth noting here that Signs' routine was discovered over time rather than designed. The reason it could afford the discovery process (rather than use a design process) is that it never intended large scale replication. Accordingly the design benefits of trading up front cost for higher and more uniform performance across units (discussed in section 2.4) were largely irrelevant.

In addition to being an appropriate setting for studying design of ostensive routines, the setting is also interesting: QPrint is modifying elements of the routine in seemingly detrimental ways. This is curious for two reasons. First, QPrint has chosen Signs because it represents best of class, so modifying its routine seems hubristic. This hubris effect was demonstrated for single outlet deviations by Knott (2003), and further explored by Winter and Szulanski (2001: 737): “We believe assessments of the benefits to improving on the template tend to be overly optimistic particularly when the prevailing template and conceptions of the Arrow core have already been shaped by substantial amounts of learning.” Second, most of the tensions between headquarters and local units that might rationally require changing the routine (such as supplying inputs to the outlets from headquarters to avoid franchisee shirking on quality) don’t apply in this instance because the units are wholly-owned.

3.2 Data Sources
Our main objective in this study is to understand the design of the routines for large scale replication. Hence, we focus on all decisions made in the context of redesigning Signs’ S&B routines for QPrint. We gathered data from a journal, interviews, and archival documents.

Journal. At our request, Signs’ CEO kept a detailed journal of the events throughout the design process. This was the primary data collection mechanism. A key strength of journals is that they provide an insider’s account of a situation (Balogun, Huff, and Johnson, 2003) and can be used to capture events in real time as they happen. The main direction to Signs’ CEO was to record all significant events taking place during the joint venture.

Interviews. We conducted several semi-structured interviews with Signs’ CEO and QPrint employees. Following Spradley (1979) we used two basic types of questions: “Grand Tour” questions that are open ended and allow interviewees to talk about whatever they think is important, and “Follow up” questions that guide the interviewee back to issues within the project’s objective. The advantage of the Grand Tour questions is that they impose no restrictions on the interviewee. This method will often lead to unexpected results well beyond the range of the interviewer’s preconceptions. The follow up questions allow the interviewer to get enough detail about a particular subject and to clarify things.

Since the journal was the main source of data on Sign’s perspective, interviews with Signs’ CEO were used initially to clarify issues raised in the journal, and used later to clarify issues raised in QPrint interviews.

The CPG manager and his deputy, both of whom were from product development, were part of all QPrint’s decisions. Other employees from operations, IT and procurement were consulted when decisions pertained to their domain. We conducted two in-depth interviews with the CPG manager. These interviews translated into thirty pages of transcripted material. He was able to take us through all the major decisions in detail. We also conducted two in-depth interviews with the operations manager. Even though directly involved in only two of the key decisions, she was a senior manager who attended all the CPG meetings, and therefore was able to give us some information about the other decisions as well. This enabled us to triangulate on the information provided by the CPG manager. We also
interviewed the procurement manager. Two other individuals declined to be interviewed. Thus, our QPrint interviews consisted of the CPG manager, and two functional managers each of whom possessed detailed knowledge of particular decisions.

Archival data. Finally we have archival data from the design process including formal documents such as contracts, meeting notes, presentations, operations manuals as well as informal documents such as notes/memos of communication between the two parties. These documents are a valuable source of data as they were captured while the design process was taking place. This offers two strengths to our design/analysis: first, they allow us to corroborate data gathered through the interviews, and add things the interviewees may have failed to recall. Second, they allow us to remove/check for any recall bias that might have been present in the interview data.

Hence, a large part of our data was captured while the design process was taking place. This is important given the potential for recall bias of interviews taking place after the fact.

3.3 Analysis

Our empirical methodology has two components. The first component is a “storyline” of the design process reconstructed from the journal, interviews and archival data. Since the journal documented the design process as it unfolded, we began with it. We clarified issues from the journal through a preliminary interview with Signs’ CEO. We then began interviews with QPrint employees. We compared transcripts from QPrint interviews with Signs’ journal and interview transcripts to determine where the various accounts did and did not match. When the accounts did not match, we examined the nature of the disagreement. When possible, factual statements from the interviews were compared with archival data. The second component of our methodology uses contentious decisions as critical incidents (Flanagan 1954) to help understand underlying phenomena. These are decisions in
which Signs and QPrint both disagreed about the best means to implement a particular element of the S&B routine\(^6\), and felt strongly about the outcome of the decision.

We use these methods for a few reasons. Qualitative case research provides rich details of firm behavior to complement large scale quantitative research in strategy (e.g. Tripsas, 1997; Tripsas and Gavetti, 2000, Zbaracki 1998). Second, the storyline approach follows Hoopes and Postrel (1999) and Montealegre (2002). These papers put together the series of events in a storyline that allows the data to tell the story. The power of this approach is that it allows readers to see for themselves the data on which the paper bases its conclusions (Miles and Huberman, 1994).

Additionally, like Hoopes and Postrel (1999) our operationalization of contentious decisions maps tightly onto the topics of interest. In attempting to quantify the value of shared knowledge to product development, Hoopes and Postrel defined “glitches” as mistakes that could have been prevented if Party A had had some piece of Party B’s knowledge. Their operationalization was to get a consensus across project participants about what constitutes a “glitch”.\(^7\)

Our operationalization of contentious decisions is somewhat simpler than their operationalization of glitches in that we do not require as much consensus. In fact, we largely require a certain lack of consensus. The parties do need to agree that a decision is important. However, inasmuch as they disagree regarding the effectiveness of particular approaches to an element of the routine, we have a starting point for examining contentious decisions. Again, like Hoopes and Postrel (1999) who required that glitches have some non-trivial cost, we require the disagreement to have obvious implications to the costs and effectiveness of the chain’s S&B routine.

\(^6\) We use the term routine to refer to the entire set of practices needed to sell and produce signs and banners at QPrint's outlets. This involves practices executed at headquarters as well as practices executed at the outlets. This decomposition of a routine into constituent practices follows the empirical approach in Knott (2003). We note here, as was noted there, that the routine is more than a particular set of practices: a) there are performative aspects that can’t be captured by the ostensive routine, and b) the entire set of practices typically requires thousands of pages of documentation. Nevertheless this approach has merit. In Knott, the performative routine accounted for roughly 20% of the performance variance across firms and specific practices captured 40% of that variance plus another 9% of the firm variance.

\(^7\) The use of contentious decisions has additional precedence in other studies of focal points: interruptions (Zeigarnik 1927), critical incidents (Flanagan 1954), and stickiness (Szulanski 1996).
4. Results

4.1 Storyline

The storyline for the S&B implementation at QPrint involves three major steps: inception of the project, search for the Arrow core, and the design process. We describe each step below and include a timeline as Figure 1.

Inception of project. From QPrint’s perspective the initial impetus for the project stemmed from a desire to increase revenues at each of its outlets. QPrint hired an executive from outside the industry known for his product development expertise. This executive ultimately became the CPG manager. His charge was to “find a business that’s worth $100 million”. His tack was to look just beyond the core business to find a breakthrough. He scanned for ideas by going to conventions, and at one convention came across a display for S&B technology. He learned that some outlets of QPrint had actually implemented S&B and that sales of S&B products/services had grown to comprise about 10 to 20% of revenues in those outlets. If the CPG manager could achieve that level of revenue increase at all outlets “he’d be a hero”.

The CPG manager presented the idea for S&B to the innovation committee, who immediately recognized that S&B customers also buy printing and vice versa. Moreover many S&B firms themselves recognized this and had begun to co-locate next to QPrint’s outlets. Given substantial evidence of the project’s potential QPrint formed the CPG to implement S&B throughout the system. (This element of storyline is important because it demonstrates that S&B was important to QPrint – thus the problems are not likely to reflect lack of commitment).

Search for the Arrow core. Having no expertise in the industry, the CPG manager began contacting S&B firms and discovered a firm, Signs, who was clearly an industry leader. Coincidentally Signs was the firm supplying signs and banners to the QPrint outlets who had already adopted S&B. The CPG manager proposed to senior management that they hire Signs to consult on design of the S&B
routine for QPrint. While initially reticent, after two months of unsuccessful attempts to learn the industry on their own, senior management agreed to a contract with Signs. (This element of storyline is important because it demonstrates that QPrint acknowledges its own lack of S&B expertise and values that of Signs)

“[Signs] helped us with operating models…some of the options we considered were: completely outsource, so the branches have merchandising materials and order forms and fax the order forms in to [Signs], who makes the product and then ships it back to [our] branch in Iowa. That was one model we considered. And then at the furthest extreme, put a real S&B operation in there. So, across each one of those models, we tried to list the pros and cons and the cost and the possible profits and ultimately we settled on the kind of intermediate model and [Signs] helped up scope out that model. So, exactly what equipment goes in? Exactly how do you lay out the space? How big is the work table? Where does the equipment go? Where do you store your supplies? All that kind of stuff [Signs] laid out for us and then actually how do you price these jobs because every single job is customized.” (This quote is important because it outlines the scope of the design effort)

From Signs’ perspective, the joint venture was also ideal. Signs had created a wholesale division which provided S&B merchandising kits to firms in adjacent industries such as quick printing. These kits expanded printing firms’ revenues without requiring additional investment. The printing firms would take orders, relay them to Signs, then resell the products for markups of 70% to 370%. Once Signs learned how successful this business model was, the CEO identified QPrint as an ideal target for the wholesale business.

“So I thought getting into [QPrint] would be a good thing, because now I have an organization that really is sales oriented, target oriented. They’re looking for long-term solutions as opposed to [a rival’s franchisees] who are extremely tight with their money”

Signs’ CEO describes the initial contact as follows:
“We spent about a half hour on the phone. Of course I was wildly enthusiastic about it, yes we could do the supply if that’s what they wanted but, proceeded to tell them about the merchandising kit and how we could get them started in the business, plus we had unique qualifications because we have not only the merchandising kit which we could sell to all the branches immediately, but we also could produce the high capacity overruns that the [QPrint’s] outlets would need, on and on and on. (This element of the storyline demonstrates both that Signs was committed to the project and that there were no incentive alignment conflicts between the two organizations).

Design Process. There were three “starting points” for QPrint’s S&B routine, all of which had to converge toward a template that was replicable across QPrint’s outlets. One starting point was the routine for S&B in place at Signs (the Arrow core). The second starting point was the routine in place for existing services at each of QPrint’s outlets. The third and final starting point was the at QPrint’s headquarters for managing the operating units and exploiting scale and scope economies across the units.

Signs’ routine for S&B was used as the template for the redesign. CPG and a set of functional managers (on an as-needed basis) scrutinized the template from the perspective of the headquarters’ routine and the operational routine at the outlets. Signs’ CEO was involved in each decision. His contract specified that he would help redesign his S&B routine for QPrint and would also help establish S&B operations in an initial set of outlets. Thereafter QPrint was expected to have perfected its template for S&B, and would be responsible for its replication to the remaining outlets.

Regular meetings were held for decision making. These included internal meetings among groups within QPrint, as well as collaborative meetings between QPrint and Signs. In some cases meetings were also held with outside vendors. A typical decision would proceed as follows: Signs would propose an approach to a particular element for the S&B routine (e.g. for purchasing equipment—which equipment to buy, from whom to buy); CPG would perform its own due diligence on that element of the routine (e.g. the equipment purchasing manager attended road shows, visited manufacturers, crunched the
numbers at the store level for different manufacturers’ equipment); Signs might or might not agree with the outcome of the due diligence, and in the case of disagreement would raise issues that CPG might not anticipate given its lack of S&B expertise. Ultimately however, CPG made all decisions regarding whether to adopt or modify elements of Signs’ S&B routine.

This process executed repeatedly over each element of S&B operations culminated in a preliminary S&B template for QPrint. This preliminary template was implemented in ten beta sites. Feedback from the beta sites was then incorporated in a revised template before rollout to the remaining outlets. In the next section we discuss elements of the routine for which this process was particularly protracted—the contentious decisions. This mapping highlights the extent to which Signs’ S&B routine was modified/preserved in QPrint’s template for the S&B routines at the outlets.

4.2 Non-contentious Decisions

The previous section outlined the general process by which the design for QPrint’s S&B routine evolved. This process description however says very little about how the routine was designed. The real design process is captured in the negotiations and decisions regarding which elements of Signs’ routine to preserve versus which to modify. In all we identified twelve major design decisions. Table 1 itemizes these decisions and provides the mapping between Signs’ routine and the QPrint routine for each of them.

Insert Table 1 about here

Of these twelve decisions, five reflected areas of contention between Signs and CPG (these are highlighted in Table 1). While our primary focus is on these contentious decisions, it is worth saying something about decisions that were benign. There were seven non-contentious decisions: samples, fixtures, employee evaluation, advertising, archiving, the pricing grid and job tracking. A summary of these is presented in Appendix A. What is useful about the non-contentious decisions is they help us understand what makes particular decisions more important than others. Both Signs and QPrint wanted the S&B venture to be successful. The contentious decisions reflect ones where both parties agree the
decision affects success, but disagree about how best to implement that element. In contrast the non-contentious decisions are ones where either the decision had little impact (the design was largely irrelevant) or where the parties agreed on a particular approach.

4.3 Contentious Decisions

As mentioned in the previous section, there were five design decisions that were contested between Signs and QPrint: the purchasing plan, the locus of vendors, the vendor for point of sales (POS) software, the locus of training and space design. In the interest of space we discuss only four of these. How QPrint decided whether to adopt Signs’ approach for each element of the routine varied across the four areas of contention. Our analysis of the contentious decisions examines the process by which the various perspectives converged toward a decision on each element of the S&B routine. Thus our documentation of the routine design process is similar to Allen’s (1977) documentation of the product design process, where he tracked each major decision in a product development and identified the resources consulted for that decision.

In the section below we describe briefly the negotiations surrounding the four key decisions. A summary of the negotiations is presented in Table 2.

| Insert Table 2 about here |

4.2.1 Purchasing Plan

*The issue:* The purchasing plan is a list of equipment and raw materials needed at each outlet to produce S&B. Signs generated the initial list from the equipment and materials inventory at its facility. QPrint’s purchasing group identified less expensive alternatives for many of the materials on the list. Negotiations centered around what was less expensive from a purchasing standpoint versus what was less expensive operationally.

8 Note we did an identical analysis for space design (available from the authors), but its insights largely match those from the other four decisions. Since it offered diminishing insights at a cost of two to three pages we chose to drop it.
**Signs’ perspective:** Signs’ CEO does not understand why QPrint’s managers question his list. In his view the list was the “ideal” material to ensure the highest quality end-product at reasonable cost. It represented the culmination of learning and experiments with a wide range of options over twelve years of successful operation. As an example:

“One of the items that I had put on was a ½ inch roll of 3M double stick tape (the purchasing manager) in the meeting is going down this list, and says ½ inch tape? Can’t we use ¼ inch tape, how come we have to use ½ inch?... I said politely, ‘well we found that to be the most versatile size for the applications that we’ve used over the last ten years’, and she quickly began to question everything that we were proposing”.

Another example pertains to special blades required for the production process. According to Signs’ CEO these are high density, finely sharpened, high quality blades that cost about $20 apiece. The purchasing manager reported to CPG that she found a vendor who would sell QPrint equivalent blades for $5 a piece. Signs had already tried those blades and found them not to work well. They were less expensive upfront, but more costly over the long run:

“If the failure rate of the cheap blades is one per week, they still might be worth it since they are so much cheaper, but the key deterrent in using them is not their short life but that they are very unreliable. Not only is there variation in the length of their useful life, but they fail suddenly with no notice...The sudden dying of the blades, to the novice, seems not a big deal. But if you have a big job due the next day, you set your machine to cut all night long. I guarantee that the blade will fail in the middle of that night with no warning. So you come in the next morning only to discover that ten feet into the material something happened to the blade, and it’s not working correctly....The costs of such failure are not only have you lost the blade, but you’ve wasted 150 feet of material at a cost of probably eighty dollars, but you also have three employees, who were there to do work, who have to sit and wait while the production is run again. Now you’re behind on assembly, you’ve squandered labor while this
stuff is re-running, you are behind in other processes, so you’re whole day is fouled up, the job is probably going to be late, all to save fifteen dollars."

Hence, Signs’ list of material is based on its experimentation, and the attendant successes and failures over twelve years. Signs’ CEO understands not only the purchasing costs for each item on the list, but also the hidden operational costs.

**QPrint’s perspective:** The purchasing manager explains that in deciding what material to purchase for each outlet, QPrint utilized Signs’ list as a starting point, admitting that they had a lot of experience, knew the trends of the industry and had set up their own operations. But they also tapped into other sources of information from vendors and competitors.

“We had some great vendors. They would keep track of who’s buying what and they would come to me and tell me, “Look, this product is not on your list but we are going through thousands of these a day”. So we had valuable feedback we would add it to the material list and stock it in the branch...The material list just went through a series of changes till we ended up with the final, and even after we ended up with the final list, it would evolve over time as we experienced the need and as we got more proficient with the process of the business”.

Despite acknowledging the expertise and experience that Signs had in preparing the material list, QPrint still did its own research because:

“we wanted to make sure we were doing what we were supposed to be doing, you know. Signs was a huge asset and very valuable to us. We just wanted to put a little bit of more emphasis on the fact that we had done our due diligence”.

**Resolution:** Many items on the materials list were changed to alternatives which Signs felt were less expensive upfront but more costly in the long run.

**Factors Affecting Resolution:**
Impacted knowledge. QPrint’s personnel lack expertise in S&B. Accordingly they couldn’t anticipate the operational consequences of their decisions (e.g. buying cheaper blades reduces upfront purchasing cost but could lead to labor and material waste and possibly poor customer service). For QPrint to fully appreciate these operational consequences, it is likely Signs would have to express those consequences in the language of purchasing professionals (lifetime cost). While his own decisions are based on an intuitive feel for these costs he has never had to “sell his recommendations” to anyone and therefore has never gathered the data necessary to quantify lifetime cost for any of the items on the list.

Locus of decision making. 1) Managers in QPrint’s purchasing department question everything on the list submitted by Signs in an attempt to maintain their control and legitimacy in the process. If they can’t identify cost savings, they won’t appear to have added value to the design process. 2) Saving fifteen dollars per week in materials cost at one thousand outlets translates into $750,000, a substantial annual savings for QPrint (and thus concrete evidence of the value procurement was adding to the routine). In contrast for Signs the fifteen dollar savings yields less than $1000 annual savings--far less than the operational costs of three or four blade failures. Since QPrint’s headquarters does not bear operational costs itself, it may underweight them.

4.2.2 Locus of Vendors

The issue: Each item on the materials and equipment list is available from a large number of vendors. Vendors fall into two broad categories: national firms who service the entire country, and local firms who service limited regions. Each sourcing approach (national versus local) offers particular advantages.

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9 Our definition of impacted knowledge follows the standard Merriam-Webster definition of impacted: deeply entrenched: not easily changed or removed. Thus it implies the current state, not the feasible state. In the case, Signs’ CEO has knowledge about how to produce signs and banners that he has never needed to articulate because he is the only person acting on that knowledge. With regard to the blade example, he has a sense that the aggregated cost savings of cheaper blades are less than the operational costs of their failures, but he has never had to quantify the latter because he acts on his intuition rather than on formal cost-benefit analysis (currently impacted). It would however be quite easy for him to estimate the costs by switching to the inferior blades for a few months (potentially explicit).
**Signs’s perspective:** Signs believes local vendors offer more personalized service than national vendors. They are more responsive to supply needs, i.e. flexible and quick in accommodating material requests; they allow temporary loans of equipment when the outlet runs into trouble with its own equipment; and they are a valuable source of information on supply industry trends. Accordingly they help Signs stay on the cutting edge of technology:

“Local distributors drop in, show you what’s new, teach you techniques, see what you are doing and suggest new ways of doing it....by going with one national vendor you cut off that option”, and “If equipment breaks down, you have no relationship with the local distributors. You have to deal with someone in (a different location)”

In addition Signs was concerned about the high shipping costs associated with using one national vendor to supply all QPrint’s outlets:

“no supplier can cover the nation without passing on massive shipping costs to their customers. I can assure you that [QPrint’s] competitors are not paying these unnecessary shipping costs and will beat [QPrint] head-to-head on price if it goes down this path”

**QPrint’s perspective:** QPrint favors national vendors for both equipment and material. They call this approach an “enterprise level solution” in which their large organization engages in a vendor contract with a few similarly large vendors. By aggregating purchases for all outlets at a single vendor, QPrint ensures its purchases comprise a sizeable share of that vendor’s sales. This share advantage provides leverage for extracting purchasing discounts as well as delivery and service priority. If in contrast each outlet purchased locally, each outlet’s purchases would comprise a very small share of a local vendor’s sales, and therefore must compete with several other local firms for the vendor’s attention.

“They (CPG) wanted to see something more localized but large companies like ours cannot manage supplies, pricing, quality or service at a local level. So we got through those challenges and set up a really decent supply chain and were able to turn over the product in enough time. So we got the supplies in when we needed them...All the vendors that we chose
could ship to any of our locations and every order that was placed by a certain time would be shipped the next day.

In addition to the leverage advantage, one of QPrint’s main objectives was to set up a supply chain for S&B that could turn around jobs within three business days. This was an aggressive target for the S&B industry. It was also the main competitive differentiator CPG wanted to create for QPrint’s S&B services. QPrint’s outlets are small and have limited capacity for storing inventory. The three day delivery target in conjunction with limited inventory at the outlets required rapid delivery by vendors. QPrint leveraged the scale of its purchasing with national vendors to secure next day delivery and other Service Level Agreements (SLAs). If each outlet were to deal with local vendors, it is unlikely those vendors would agree to the SLAs because of the outlet’s small share of sales.

A final concern of QPrint’s purchasing manager was uniformity—both uniform quality and uniform materials costs to support QPrint’s national pricing of its S&B products.

“We don’t have any control over the materials prices (if branches deal with local vendors) and it would throw the whole pricing model out in the water…we did national pricing on the products that we were selling to the customer and we did that based on what our spend is for the supplies. So if they go off and do local supplies at whatever price they feel like paying…it has a certain effect on the Return on Investment…Plus we don’t have any way of knowing what the branches were doing and one of the big driving forces was standardizing, standardizing, standardizing across the branches”

Resolution: QPrint picked a single national vendor for equipment, and approximately two to three national vendors for different types of materials. One of these national vendors opened outlets near QPrint’s outlets so that QPrint could get local service but at the nationally negotiated prices (best of both worlds). QPrint also had a back-up vendor for material in case the main vendor had supply difficulties.

Factors affecting resolution:

Impacted knowledge. Signs’ CEO knows he obtains better service from local vendors. He ascribes this to “localness”. However he fails to recognize this level of service may be attributable to his
power as a buyer (large share of local vendor sales). This is the same benefit QPrint is trying to achieve, but can only do so by aggregating purchases at a national vendor.

**Capturing externalities.** By aggregating purchases, QPrint had leverage with vendors which allowed it to extract pricing discounts and delivery concessions. Having a single national vendor was a means to control at least one source of variation in unit quality.

**Locus of decision-making.** Managing a system of multiple local vendors for equipment and material for its five hundred plus outlets would entail additional managerial costs which Signs does not bear at a single outlet.

4.2.3 Point of Sales (POS) Software

*The issue:* Point of Sales (POS) software is a system for taking S&B orders and tracking them through production. This software embodies many of the skills involved in order taking, and therefore facilitates the use of lower-skilled labor at each of the outlets. Signs has developed its own POS software and recommends QPrint use it. QPrint however wants to evaluate several POS software packages using a weighted comparison of the features.

*Signs’ perspective:* Signs’ POS software has become more sophisticated over time through a combination of frustrations with existing software and Signs’ intimate understanding of the business. According to Signs’ CEO, his POS software is a win-win for QPrint as he is not charging them very much for it, and it embodies many of the skills necessary for S&B.

“Our system was incredibly easy to use, did all the calculations automatically. You could hit help buttons and it would show actual pictures of the product, it gave design hints. In other words, it’s sort of an on-line selling manual and it was also an on-line production manual with lots of visuals, very easy to use. To that we added a – first it was just a quick price function, then we actually created a whole work order function plus an invoicing function, a quote function, you know, basically turned it in to a complete order entry and sales package. …I showed them the software, and told them something like this was coming, and they loved
it. I had everyone from managers to front counter people to [S&B] employees to outside 
sales people looking over my shoulder saying, yea, yea, yea, this is real easy, this is exactly 
what we need.”

Furthermore, Signs’ CEO felt that QPrint’s weighted analysis was inadequate for making the decision.  

“Missing something critical gets you zero points, doing five things that would be nice gets 
you the same amount of points as doing one critical thing right but they’re two completely 
different things. Also, in no way is there anything related to price, training, implementation, 
those kinds of things.”

QPrint’s perspective: QPrint views the POS software as a routine software purchase decision.  

They formed a team comprising an information management professional, a software purchasing 
professional and a process person. The team took direction from CPG regarding functional requirements 
for the software, then developed a weighting scheme for evaluating software packages along these 
dimensions. In addition to requirements specific to S&B, the team evaluated standard software criteria 
such as ease of learning and use, customizability and level of technical support. They solicited 
presentations from multiple vendors and performed a weighted comparison of the features of each 
software package.

The team had some concerns with Signs’ software. It was not scaleable to the size that they would 
need, nor was it compatible with the existing POS system for other services at the outlets. According to 
the key manager in CPG:

“A problem that the organization already had was proliferation of information systems. You 
had Apple and Mac, the PC for production – it just gets completely out of control for them, 
another type of estimating software, all sorts of technical software, design software”

Resolution: QPrint used its existing POS software and utilized the “99” key for all S&B sales 

Factors affecting resolution: 

Impacted knowledge. The software team does not understand S&B and therefore cannot 
completely evaluate the S&B benefits embedded in Signs’ software. While Signs’ CEO can laud the
subtleties of his software, there is no one in the organization who can assess its usefulness for supporting S&B, much less value its subtleties. QPrint’s inability to weight the S&B benefits forces them to focus on (weight more heavily) factors they do understand such as scalability and compatibility.

Capturing externalities. The outlets already have several software packages in place. Ideally S&B POS software would integrate with existing software.

Locus of decision making. QPrint frequently procures software, and thus has developed a routine for comparing software vendors. It sees the S&B POS software as a typical purchase, but doesn’t realize that evaluating functionality for a new purpose differs from evaluating functionality for a service which the outlets already perform.

4.2.4 Training

The issue: S&B is new to the organization. Therefore QPrint needs a system to do initial training for each outlet, plus provide ongoing training for new employees. The issue is whether to use QPrint’s internal training department or outsource training.

Signs’ perspective: Signs is concerned first that the training department has no expertise with S&B, and second that they have very limited success even where they do have expertise.

“[The training department] would like to have a piece of this training activity yet when you push them for other recent efforts you realize that they have failed dramatically. My point here was that [an outside vendor] is currently doing the in-house training for [QPrint] for [machine y]. These machines are in every single branch, virtually every branch and it’s a key part of the S&B package. I understand you want to take over training for all S&B but you’re not even training on this piece of equipment”

In addition there is an obvious alternative—the vendor who is currently doing the training for machine y at QPrint:

“[The vendor] made a presentation where he offered up a total support package, which training was all included, introduction to S&B…equipment, training module, kick off
meetings, support, website for support, which would have tied into a pricing website. In other words, a total package that he would coordinate which was a much broader package then what was brought to the table by the training department, which is just sad….They’re beating up poor [vendor representative] over the price of the program without, again, any discussion of benefits, it’s strictly a cost side: ‘this is too expensive’. Relative to what and for what we’re receiving, this is never brought out and mentioned or discussed.”

**QPrint’s perspective:** QPrint believes it should conduct training internally because it would be less costly, and because the training department feels it should have a role in S&B. QPrint was concerned that S&B employees would need higher levels of training (approximately four times as much as training in the core services). Moreover S&B skills are not easily transferable to the core business and vice versa. The range of activities to be managed by the single S&B employee was “highly unusual” for QPrint’s core business. “You never have one person doing all of this”. CPG was concerned with retaining these skilled employees, particularly given the investment in their training and the cost of training their replacements. According to the lead manager in CPG:

“Each outlet has twenty-five employees in the core business and if one of them just leaves, they bring in a new person and he gets trained by all the others. But in the new business even with two to three workers they are extremely vulnerable to the loss and the training that is extremely timely and expensive”.

A final reason for wanting lower training costs was that QPrint benchmarked its training costs per employee to those of McDonald’s. This was perhaps not unreasonable for their core business, but was not a reasonable comparison for S&B due to its greater skill requirements.

**Resolution:** QPrint started with in-house training by Signs employees in the first few outlets. It then outsourced training to a specialist training firm. This training firm designed a variety of programs—web-based training, centralized class room training, and on-site training at the outlets. The firm also provided technical support for the equipment. Ultimately QPrint adopted online training using a module developed by the training firm. It did away with in-store training. New employees at an outlet were sent
to another outlet to learn S&B. There was no formal, structured training program for them. According to the lead manager for CPG:

“In the first roll out phase I, the [S&B] co-workers got one week of training, not so bad. Now, they get two days in a neighboring [S&B] location and a web address...you just can’t figure out how to do this stuff in two days at watching somebody and fooling around with an interactive web program.”

Factors affecting resolutions

Locus of decision making. 1) Training is a headquarters line item, while operational consequences of insufficient training are borne by local units. The costs/savings associated with training may be the largest single S&B expenditure (high skill training of at least two employees per outlet plus recurring training). 2) Since the skills required for existing operations are minimal, all employees share these skills, and therefore the loss of one employee (4% of capacity) is trivial. Moreover, the other twenty-four employees at each site can step in to cover the loss and can also train the new employee. Because of this, headquarters may implicitly believe that recurring training is the outlets’ responsibility. However the S&B skills are more highly skilled, and more expensive to teach. Accordingly each outlet would only have two or three S&B employees. With so few employees, the loss of one employee reduces capacity by 33 to 50% and even further during the periods when the remaining employees must train the new employee (forty hours each from the experienced employee and the trainee).

5. Summary

Our analysis using interviews and archival data reconstructed the process by which a chain who had purchased the S&B Arrow core redesigned it prior to rollout. By examining that process we were able to identify four critical design decisions exhibiting tensions between the Arrow core (embodied in Signs’ perspective) and QPrint. These contentious decisions included the purchasing plan, the locus of vendors, POS software and training. These four decisions shared some common tensions. These include
problems of impacted knowledge, compatibility with existing routines, and locus of decision making.\textsuperscript{10}

The mapping between the critical design decisions and the tensions is contained in Table 3. We now discuss each of the tensions and their implications for theories of the Arrow core and design of routines for replication.

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\textbf{Impacted knowledge} & One of the central issues in redesigning Signs’s routine was the lack of knowledge each party had for the other’s expertise and constraints. QPrint’s functional managers did not possess technical knowledge of S&B. Hence, they could only understand the implications of their design decisions if those implications could be codified in generic terms such as cost. Without such codification, they had trouble making tradeoffs between elements of Signs’s routine and other alternatives. Similarly Signs’ CEO who did have technical knowledge of S&B, lacked understanding of QPrint’s goals and constraints (such as the role of central purchasing in maintaining uniform costs and quality).
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\textbf{Compatibility with existing routines} & The routine is not for a startup operation, but rather will become integrated into an existing system of outlets. Accordingly the new routine must fit with existing equipment and capabilities at the outlets, as well as with headquarters’ routines for capturing scale economies across the outlets. With respect to compatibility with outlets are simple issues of having common operating systems for computers, to more complex issues of matching the new routine to the skill base of the outlets’ employees. Just as it is necessary to deskill manufacturing operations to convert them from labor-intensive operations to automated processes executed by dedicated equipment, there appears to be a similar effort to deskill routines for a large scale rollout across chains/franchises (Hamori
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\textsuperscript{10}Note that when the non-contentious decisions deviated from Signs’ routine they tended to do so for the same reasons as the contentious decisions (column 3 of appendix A). Thus these are properties of the redesign process generally, not just sources of contention.
& Cappelli, 2005). POS software was a means to deskill the routine, but unfortunately there were issues of compatibility with existing software preventing its adoption.

**Locus of decision making:** One might expect fit issues to be most pronounced with respect to existing operations at the outlets. However the decision process at QPrint seemed to place relatively more emphasis on the fit with headquarters’ routine. This appears to be a natural consequence of wresting decision making with corporate employees. This emphasis on fit with headquarters’ activities is warranted so long as those activities improve the system-wide efficiency or effectiveness of S&B (such as with national vendors) However there is some evidence that decisions were being influenced by turf protection (preserving the training department). Moreover there is evidence of potential incentive alignment problems between headquarters and outlets. Headquarters does not bear the costs associated with executing routines at the outlets. Thus is may not fully weigh the operational consequences of its decisions (blade failure, untrained employees, sub-optimal software). This is particularly true for large expenses allocated to headquarters rather than units (training, POS software).

6. **Epilogue: Aggregate consequences of the deviations**

QPrint’s contract with Signs ended in September 2001 following implementation of the S&B routine in ten outlets. Ultimately the S&B routine was introduced in 30 to 40% of QPrint’s outlets. After five years of S&B experience, sales are 80 to 90% below QPrint’s goals. The vendors who committed to the strict SLAs have been greatly disappointed. The problems involve merchandising: insufficient in-store promotion for S&B, training—employees can neither sell nor produce signs, and the POS software. The POS software was a potential substitute for training since it embodied much of the design/sales skills. However, given its implementation as a “99” key (miscellaneous sales) on the existing POS computer, it neither aids sales nor tracks the type of sales.

In Fall 2006 (five years after the Signs-QPrint contract ended), QPrint built an entirely new team to rebuild the S&B routine from scratch. They offered Signs carte blanche to redesign the routine if it were willing to consult in the redesign process.
7. Discussion

The goal of our study was understanding design of routines for large scale replication. This is an important problem because chains are the dominant form of organization in the dominant sector of the economy. Moreover routines are the primary source of value in chains. Capturing the value of those routines requires large scale replication. While the prior focus in the routines literature has been replication itself, we shift the focus to design. We argue that design not only affects chains’ ability to replicate routines, but also affects the quality and consistency of what gets replicated. Accordingly the study of design of routines for large scale replication has tremendous potential to improve the operational performance of chains.

The approach we take is first to argue that routines can (and should be) designed. This argument is necessary because a prevalent view in the literature is that routines are enacted, and thus inherently “undesignable”. We exploit Pentland and Feldman’s distinction between the ostensive and performative aspects of routines to show that while enactment is important and inevitable, the ostensive component circumscribes the enactment of the performative component. We show from the literature that 1) the ostensive component of routines (even in studies of enactments) is designed/specified, 2) there is variance in the level and quality of that specification, and 3) that the quality and level of specification of the ostensive routine affect the mean and variance of the performative routine.

While this evidence from the literature suggests an important role for design of routines, to our knowledge there is no treatment of design of routines in the literature, thus to build a “theory of design for replication” we began with an exploratory study of what is happening in practice. The basis for the study was an anomalous case where a firm purchased a highly evolved routine, then deviated from it as it redesigned it for replication. These deviations allowed us to focus attention on the most important elements of the routine—since deviating by definition suggests both that the element is important and that there is some superior way to execute it (else by default the chain would preserve the existing routine).
While there are some classic management lessons that QPrint ignored: “what gets measured gets attended to”, “involve all affected parties in the process”, “use global incentives to achieve cooperation”, there were many things that QPrint did right: identifying a lucrative product line (S&B), identifying an appropriate template (Signs), representing both operating units (Signs) and headquarters (CPG) perspective in the design process. So this is not merely a study of “stupid managers”. In fact, these salient observations distract us from our main focus which is design of routines. With regard to this primary focus, the case offers three insights:

First, the ostensive routine can be designed—though of course that was evident merely from the existence of the case. Perhaps a more interesting observation from the case pertains to when we see design versus discovery. While Signs’ routine was discovered over time in the manner discussed by Winter and Szulanski, QPrint’s routine was designed up front. The reason we might see this discovery-design dichotomy in practice is that Signs was a single unit operation and thus incurred no inherent tradeoff between up-front efforts and ex-post performance. In the case of chains (our focus), the benefits of upfront design: 1) are multiplied by the number of outlets over all subsequent periods, and 2) lead to greater consistency across units.

Second, design of the ostensive routine conditions the performative routine—Qprint’s aggregate revenues were far below their forecast and none of QPrint’s outlets came close to achieving Sign’s 5-year performance. Though we are unable to directly link differences in the routine to quantitative differences in performance, details of the case allow us to infer that QPrint’s routine had lower ability to stimulate demand (no POS software for design) and lower ability to execute the demand that did materialize (untrained employees with lower quality equipment and supplies).

Third, the design process affects the ostensive routine and accordingly the mean and/or variance of the performative routine. The design process at QPrint involved compromises on elements of the routine where headquarters’ goal of minimizing costs/maximizing benefits observed at the headquarters conflicted with outlets’ goals of minimizing local costs/maximizing local demand. Since headquarters controlled the design process, their goals prevailed. This problem resembles the problem in the
manufacturing sector where engineering designs a product that optimizes performance at the expense of manufacturing cost. Thus a related “finding” is that a theory of “design for replication” (DFR) may benefit from “design for manufacturing” (DFM) theory (see for example Clark and Fujimoto, 1991, Clark and Wheelwright, 1995; Hauptman and Hirji, 1996, 1999, Maidique and Zirger, 1984, 1985). There are important distinctions between the retail/service sectors and the manufacturing sector which preclude wholesale adoption of DFM for DFR. First, in the retail/service sectors both headquarters and outlets co-execute the routine in perpetuity, whereas in the manufacturing sector manufacturing alone produces the product in perpetuity (the role of engineering disappears). An additional difficulty of DFR relative to DFM is that DFM merely requires repeatability over time in a single location whereas DFR requires repeatability over time and across location. Both these distinctions provide important opportunity for building new theory unique to routines.

In summary, we argue that routines can (and should) be designed for large scale replication. Design of the ostensive routine affects the quality and variance of the performative routine and the design process itself affects all three. Given this and given the large and growing importance of chains, we propose that design of routines for replication (DFR) is a worthwhile pursuit of organizational theory. DFR would address such issues as the tradeoff between designed versus discovered routines (greater specification of Figure 2), elements of a “good” design (degree of specification versus local flexibility, which activities to aggregate at headquarters versus control locally), and elements of a good process (who to involve at what stages with what authority). Such a literature would potentially achieve productivity and quality gains for chains equivalent to those DFM achieved for manufacturing or scientific management achieved for job skills.
References


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Appendix A. Non-contentious decisions

<table>
<thead>
<tr>
<th>Design element</th>
<th>Description and rationale for lack of contention</th>
<th>Reason for deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samples</td>
<td>Both parties agreed on the need for samples. Signs recommended full-size samples, while QPrint favored reduced version. Samples represent a much larger cost to QPrint than Signs because of the need for sets at all outlets. Signs has no need to reduce them, but doesn't feel the reduced version will affect their usefulness.</td>
<td>Locus of decision making</td>
</tr>
<tr>
<td>Fixtures</td>
<td>Signs has a custom table that catches output from the printer. It's height matches that of the printer to make output flow more fluid. QPrint wants S&amp;B fixtures to match the existing fixtures in outlets. Signs doesn’t feel the height difference will significantly affect performance.</td>
<td>Compatibility with existing routines</td>
</tr>
<tr>
<td>Employee evaluation</td>
<td>Signs promotes employees based on S&amp;B skills because this is the dominant operational skill. QPrint promotes on broader criteria because promotions are likely to require more expertise than just signs (other existing operations)</td>
<td>Compatibility with existing routines</td>
</tr>
<tr>
<td>Advertising</td>
<td>Signs advertises principally through yellow pages because this is the most cost effective way to reach its (local) market. QPrint is a national firm and therefore has more cost effective ways to advertise</td>
<td>Compatibility with existing routines</td>
</tr>
<tr>
<td>Archiving</td>
<td>Signs keeps electronic files of all jobs so customers can place repeat orders via phone/email. QPrint decides not to do that. Since the main goal for Signs in the joint venture is the subcontracting work from QPrint, it will archive those jobs and thus doesn't care what QPrint decides</td>
<td>Locus of decision making</td>
</tr>
<tr>
<td>Pricing grid</td>
<td>This is a small one time cost to print an S&amp;B pricing grid for each outlet. QPrint adopts Signs approach</td>
<td>No deviation</td>
</tr>
<tr>
<td>Job tracking</td>
<td>This is a small one time cost to build an S&amp;B job tracking board for each outlet. QPrint adopts Signs approach</td>
<td>No deviation</td>
</tr>
</tbody>
</table>
Figure 1. Link between ostensive specificity and performative variance

![Graph showing the link between ostensive specificity and performative variance. The x-axis represents the steps of choosing instruments, specifying orchestra members, specifying conductor, scores for each instrument, and score. The y-axis represents the variance in symphony performance. The graph shows a downward trend as the steps progress.]
Figure 2. Routine’s efficiency and cost to adopt over time under discovery versus design

Figure 2a. Permanent efficiency of routine versus order of adoption

![Graph showing efficiency improvement under discovery vs design](image)

Figure 2b. Adoption cost of routine versus order of adoption

![Graph showing adoption cost under design vs discovery](image)
Figure 3. Timeline of QPrint’s S&B routine design process

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Inception of Project &amp; Search for Arrow Core</th>
<th>Design Process</th>
<th>Store Launch Milestones</th>
<th>Contentious Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sites Launched</td>
<td>Other</td>
</tr>
<tr>
<td>2000</td>
<td>1</td>
<td>CPG manager hired by chain</td>
<td></td>
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<tr>
<td></td>
<td>2</td>
<td>CPG manager scouts for new business</td>
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<tr>
<td></td>
<td>3</td>
<td>potential to generate business worth $100</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>4</td>
<td>million)</td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td>Identifies and sells idea of S&amp;B business</td>
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<td></td>
<td></td>
<td>to top management</td>
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<tr>
<td></td>
<td></td>
<td>Contact/Discussions with entrepreneur</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Entrepreneur comes on board with mandate</td>
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<tr>
<td></td>
<td>6</td>
<td>to help set up 10 shops</td>
<td></td>
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<td></td>
<td>7</td>
<td>Design process starts</td>
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<td></td>
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<td></td>
<td>9</td>
<td>Contract signed between Entrepreneur and</td>
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<td>chain</td>
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<td>10</td>
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<td></td>
<td>11</td>
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</tr>
<tr>
<td>Year</td>
<td>Month</td>
<td>Sites Launched</td>
<td>Other</td>
<td>Procedure Manuals</td>
<td>Phase of 3 Beta sites</td>
</tr>
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</tr>
<tr>
<td></td>
<td>2</td>
<td>Chain</td>
<td>Site launched by now</td>
<td>Draft of S&amp;B Procedures Guide ready</td>
<td>Entrepreneur expresses concerns about chain’s preference for national vendor for consumables items</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Chain</td>
<td>Site launched by now</td>
<td>Draft of S&amp;B Procedures Guide ready</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Chain</td>
<td>1st site launched by now</td>
<td>Draft of S&amp;B Procedures Guide ready</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Company</td>
<td>3 sites launched by now</td>
<td>S&amp;B Procedures Guide revised</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Entrepreneur</td>
<td>3 sites launched by now</td>
<td>S&amp;B Procedures Guide revised Program Implementation Kit (for larger roll-out) ready</td>
<td></td>
</tr>
</tbody>
</table>

Entrepreneur feels chain is ready to launch new sites on their own

Entrepreneur provides his list to purchasing dept. Discussions with purchasing dept. start

Entrepreneur offers its own web-based POS program to QPrint

Entrepreneur does training (hands-on; in-store training)
<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Sites Launched</th>
<th>Other</th>
<th>Procedure Manuals</th>
<th>Phase of 3 Beta sites</th>
<th>Phase of initial 10 sites</th>
<th>Purchasing</th>
<th>Point of Sales Software</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8 sites launched by now 1 in training phase 4 in construction phase 9 in space planning phase 9 market areas identified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chain evaluates software of 3 external vendors, entrepreneur, and an internally generated system Vendors make presentations</td>
<td>Entrepreneur continues to train External training company enters (hands-on; in-store training)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>Chain launching sites on its own Last one in launched by chain's template</td>
<td>Target number of stores increased to 150 (from earlier 60)</td>
<td></td>
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<td></td>
<td>Chain asks vendors to fill in software evaluation forms to help it evaluate the 5 systems</td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>9</td>
<td>Entrepreneur's contract with chain ends 10 sites launched by now</td>
<td>Target number of stores increased to 253</td>
<td></td>
<td></td>
<td></td>
<td>POS system decision in favor of an external vendor</td>
<td>Training dept. at chain wants to train themselves</td>
<td></td>
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<td>10</td>
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<td>2002</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Entrepreneur stays on as consultant after contract ends</td>
<td>Larger roll-out planned in 2002 Target revised to S&amp;B in every store</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Training shifted to on-line modules</td>
<td></td>
</tr>
</tbody>
</table>
Table I. Mapping the Arrow core (Signs’s routine) to QPrint’s routine

<table>
<thead>
<tr>
<th>Area/Routine</th>
<th>Signs’s Routine</th>
<th>QPrint’s routine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing: Choice of Suppliers (Material)</td>
<td>Multiple Local vendors</td>
<td>Single National vendor</td>
</tr>
<tr>
<td>Purchasing: Choice of Suppliers (Equipment)</td>
<td>Local vendors/dealers</td>
<td>National vendor</td>
</tr>
<tr>
<td>POS Software</td>
<td>In-house developed software</td>
<td>Software of large vendor specializing in the industry</td>
</tr>
<tr>
<td>Training</td>
<td>In-house and external training; hands on training</td>
<td>External training, and in-shop training (hands-on) Later this changed to online training (not hands-on)</td>
</tr>
<tr>
<td>Sales consultation process (Space design)</td>
<td>Exclusive counter (it is their sole business)</td>
<td>“Store within Store”</td>
</tr>
<tr>
<td>Samples</td>
<td>Actual life size samples</td>
<td>Books with mini versions</td>
</tr>
<tr>
<td>Fixtures (e.g. tables)</td>
<td>Custom-designed, which is the right size</td>
<td>Purchased in-stock furniture from vendors, some tables are too high, placement wastes space</td>
</tr>
<tr>
<td>Employee evaluation</td>
<td>Promoted based on skills developed on the job</td>
<td>Promoted based on history (criteria like whether the employee reaches work on time, does his work well; these criteria had nothing to do with the skills needed for the signs business)</td>
</tr>
<tr>
<td>Advertising</td>
<td>Yellow pages</td>
<td>Store displays; periodic advertisements in media</td>
</tr>
<tr>
<td>Archiving system</td>
<td>Have software to archive jobs since customers expect Signs to have previous jobs</td>
<td>No electronic file saving</td>
</tr>
<tr>
<td>Pricing grid</td>
<td>Have developed a pricing matrix that allows employee to figure out pricing based on several criteria of the specific job</td>
<td>Put in place a similar pricing grid</td>
</tr>
<tr>
<td>Job Tracking</td>
<td>Wall display of the process orders work</td>
<td>On the wall display of works in progress</td>
</tr>
<tr>
<td>Decision</td>
<td>Description</td>
<td>The Issue/Contention</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>I</td>
<td>PURCHASING PLAN</td>
<td>The purchasing plan is a list of equipment and raw materials needed at each outlet for S&amp;B.</td>
</tr>
<tr>
<td>II</td>
<td>LOCUS OF VENDORS</td>
<td>The material for S&amp;B can be procured from national vendors servicing the entire country, or from local firms who service limited regions.</td>
</tr>
<tr>
<td>III</td>
<td>POINT OF SALES (POS) SOFTWARE</td>
<td>Signs proposes that QPrint procure POS software package to design, price and track S&amp;B orders.</td>
</tr>
<tr>
<td>IV</td>
<td>TRAINING</td>
<td>QPrint needs means to provide initial training for all outlets as well as recurring training for new employees. Because S&amp;B requires more skill than existing operations, and because there won't be enough S&amp;B employees at any outlet to train new employees, the training demands for S&amp;B are at least five times that for existing operations.</td>
</tr>
<tr>
<td>Table III. Mapping of critical S&amp;B design decisions to underlying tensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compatibility with outlets’ routines</strong></td>
<td><strong>Locus of decision making</strong></td>
<td><strong>Impacted knowledge</strong></td>
</tr>
<tr>
<td><strong>Purchasing plan</strong></td>
<td>Saving $15 per week per outlet saves $750,000 annually (aggregated at corporate level)</td>
<td>QPrint doesn’t grasp operational consequences of its decisions</td>
</tr>
</tbody>
</table>
| **Choice of vendors** | -Multiple local vendors substantially increases the purchasing department workload  
-Local vendors can’t support “enterprise level solutions”  
-Aggregating purchases across outlets creates bargaining power with suppliers | |
| **POS software** | Outlets already have several computers and software packages | Without technical knowledge of S&B, can’t define or weight significance of functional requirements |
| **Training** | Cross-trained employees at each outlet serves as a “costless” means to train new employees. Headquarters may rely too heavily on this | -Training demands for S&B appear to be 40 person-years upfront plus recurring costs of 20 person-years (incurred at HQ). This produces substantial pressure to reduce cost  
-Decision makers do not bear operational consequences of training decision |