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Mixing Bricks and Clicks: Organization Designs for Business-to-Consumer Electronic Commerce in Incumbent Retailers

George Westerman
Massachusetts Institute of Technology

MIXING BRICKS WITH CLICKS: ORGANIZATION DESIGN FOR BUSINESS-TO-CONSUMER ELECTRONIC COMMERCE IN INCUMBENT RETAILERS

George Westerman
Sloan School of Management
Massachusetts Institute of Technology
Cambridge, MA USA
georgew@mit.edu

Abstract

Researchers disagree over the extent to which organizations can introduce innovations such as electronic commerce within existing organizational structures. Some argue that such innovations require completely autonomous innovating units. Yet, such autonomous units may have difficulty making use of scale, skills, and infrastructure in the established organization. This paper attempts to resolve the apparent conflict by building and testing a new theoretical model of organizing to adopt a discontinuous innovation. Using concepts from technology strategy and organization theory, it builds a hybrid model in which organizations simultaneously build new subunits and leverage existing ones to adopt the innovation. Two characteristics of each component in the innovation translate to two aspects of subunit-level organization design. The theoretical model is tested using a novel database of organizational structure and financial performance for the e-businesses launched by 36 incumbent retailers. The study contributes to theory by helping to resolve a long-standing debate, and contributes to practice by providing guidelines to help managers in organizing to adopt innovations.

Keywords: Innovation, electronic commerce, IT strategy, organization design, project management

1 INTRODUCTION

Technology management scholars have shown that some types of innovations can enhance the competitive advantage of incumbent firms, while others destroy them. In particular, innovations that are discontinuous, meaning that they represent a radical leap along a product's performance trajectory (Anderson and Tushman 1990) or move the product to a new trajectory (Christensen 1997), can be highly deleterious to the survival of incumbent firms.

Unfortunately, researchers differ on the question of how incumbent firms can organize to adopt discontinuous innovations. Some authors suggest that discontinuous innovations cannot be developed within existing organization structures (Christensen 1997). The uncertainty and competence destruction inherent in discontinuous innovations can engender inertia and make it impossible for the organization to adapt.

Yet, separating the innovating units can prevent them from making use of valuable resources and capabilities in the existing organization. That is why other authors suggest that firms can and should be able to innovate within existing organizational structures (Brown and Eisenhardt 1997; Iansiti 1997). Unless a firm can adapt its existing competencies to new applications, it will quickly fall behind the competition.

This debate is echoed in the experiences of many retailers adopting electronic commerce (e-commerce). Consider the dilemma facing an e-commerce manager in a large incumbent retailer such as Sears. If she tries to make use of the marketing capabilities

of her $40 billion firm, or tries to use the fulfillment infrastructure of the firm's $1 billion catalog subsidiary, she may gain tremendous amounts of efficiency and leverage. However, she may also encounter debilitating inertia.

Some firms, such as Walgreens and Eddie Bauer, chose an integrated approach to adopting e-commerce. Others, such as Barnes and Noble and K-Mart, chose to create e-commerce organizations that were highly separate from their existing businesses. Recently, it has become clear that a hybrid "bricks and clicks" model, with online and offline capabilities, can be a powerful source of competitive advantage (Gulati and Garino 2000). However, beyond case studies, there is little literature that describes how a manager might design such a hybrid organization effectively.

This paper builds a theoretical model of a hybrid approach to organizing. The selection of organization design for each subunit of the innovating organization is driven by two characteristics of each product component, namely the extent of new competence required to adopt that component and the component's coreness. The model is tested empirically in the context of 36 retailers' e-commerce initiatives. The model receives strong support, indicating that firms can make use of existing competencies while adopting a discontinuous innovation. After controlling for some key drivers of performance, firms whose e-commerce approach fits the theoretical model of mixing bricks and clicks appear to outperform those that do not.

2 THEORETICAL MODEL

The theoretical debate over the best form of organization to adopt a discontinuous innovation arises partially because authors tend to work at the firm level, while much of the organizational inertia and leverage is at the level of individual bundles of capability. If we consider the organization design issue at the level of particular components and their related competencies, then we are able to define a hybrid organizational structure that blends new and leveraged units to build and manage the innovation.

The remainder of this section briefly describes aspects of organization design and technology strategy that are key to developing the hybrid model of organizing. The paper then presents the theoretical model and the research design and findings.

2.1 Organizations, Subunits, and Contingencies

Structural contingency theory describes the importance of a fit between organizational structure and strategic contingencies. These contingencies, most notably *uncertainty* and *interdependence*, vary from subunit to subunit. When two subunits face different levels of uncertainty, they must be differentiated from each other. Yet, differentiation can create coordination difficulties. Thus, subunits that are interdependent must be integrated either through reporting relationships or integrating roles in order to ensure coherence across the organization (Galbraith 1974; Lawrence and Lorsch 1967). Balancing differentiation and integration is difficult, but firms that match their organization designs to existing levels of uncertainty and interdependence outperform those that do not (Lawrence and Lorsch 1967).

Unfortunately, contingency theory tends to be an equilibrium view of organizations, and mechanisms of adaptation are not well described (Donaldson 1995, p. 230). Adopting innovations is, by its nature, a nonequilibrium process of adaptation, and contingency theory has not been shown to extend very far into this domain. The model presented below extends classic contingency theory by linking the organizational concepts of uncertainty and interdependence to characteristics of the innovation's components.

2.2 Products, Components, and Innovations

Technology strategy describes products in terms of components and linkages. Two characteristics of each product component are relevant for the model. The first is a component's *coreness*, meaning the extent to which it is tightly coupled to other components in the product (Tushman and Murmann 1998). Changes in a core component tend to ripple throughout the rest of the system, impacting the designs of other components. On the other hand, changes in peripheral components tend to remain isolated to the component itself.

Another key concept is the extent of change an innovation requires in existing competencies (Anderson and Tushman 1990). In particular, when an innovation requires high levels of new competence acquisition (NCA), meaning that the firm needs to internalize many new competencies from outside of the firm, incumbents can have great difficulty adopting it. This is especially true when the NCA requirement occurs in a core component of the product (Gatignon et al. 2002).

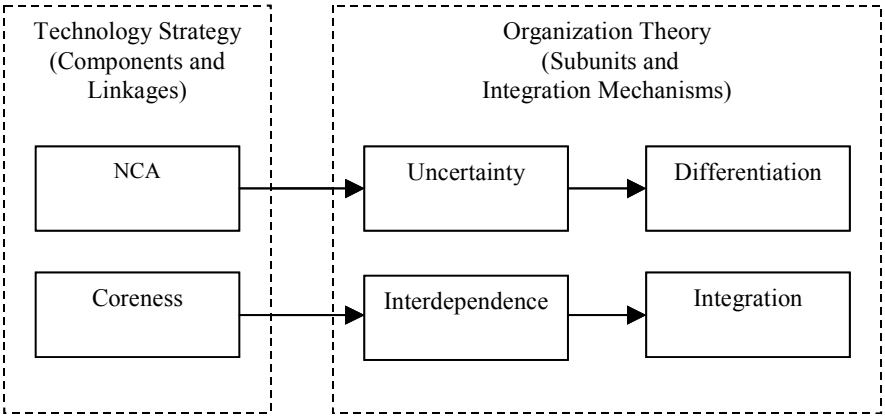

Figure 1. Conceptual Links Between Technology Strategy and Organization Theory

2.3 Building the Model

The model presented in this paper creates a novel link between technology strategy and organization design (see Figure 1). By linking these two sets of constructs, the model derives an ideal organization design for a particular innovation. This model is a hybrid of new differentiated subunits and existing subunits driven by the new competence acquisition and coreness of each component. The model is presented below.

2.3.1 New Competence Acquisition Drives Subunit Separation

Discontinuous innovation creates high levels of uncertainty (Anderson and Tushman 1986). The innovation may or may not be able to make use of existing competencies or existing market linkages (Abernathy and Clark 1985). While incumbents tend to emphasize exploitative learning routines aimed at driving efficiencies from existing product/market combinations, innovation presents a different set of challenges (Abernathy 1978). Investigating new opportunities and learning new competencies requires an experimental, exploratory set of learning processes that differs sharply from exploitative routines (McGrath and MacMillan 2000). In fact, an emphasis on efficiency can reduce innovativeness (Abernathy 1978).

Moving to the component level of analysis, we may find that the exploratory and exploitative requirements of an innovation will differ from component to component, depending on the extent of technological change in each component. This would suggest that different components would place different requirements on the innovating organization. The exploitative routines in the firm may help in producing some components, but hinder the production of others. In particular, existing competencies and exploitative routines will be least useful for producing components that undergo the highest degrees of technological change, since they may create harmful inertia. Inertia will be lower for a high-change component if it can be developed in an organization that has an exploratory rather than an exploitative orientation. Unfortunately, that may mean creating a new subunit to produce the component.

If new competence acquisition (NCA) is a measure of the extent of technological change in a component, then we would expect the following:

> *Assertion 1: Organizational differentiation will be more effective for subunits providing components that require high levels of new competence acquisition, and less effective for components that require low levels.*

2.3.2 Coreness and Subunit Reporting

Assertion 1 describes differentiation but not necessarily integration across subunits. Mixing new subunits and existing ones may create extreme coordination difficulties. The issue of integration is addressed in the following section.

Earlier, a description was given of how discontinuous technological change in a core component tends to drive change throughout the system, while discontinuous change in a peripheral component tends to have a much more localized effect. This is because core components are much more tightly coupled to other components than peripheral components are.

It is clear that the concept of coreness is related to the organizational concept of interdependence. Organizational theorists suggest that organizations must use integrating mechanisms to manage interdependencies between subunits. As interdependence between two subunits increases, the strength of the integrating mechanism must increase. While there are many types of potential integration mechanisms, the reporting relationship is one of the strongest (Galbraith 1974).

In the case of an innovating organization, we can envision the need for an innovating manager, responsible for coordinating across all of the subunits producing the innovation. That person is the manager in charge of the innovating effort. Yet, this person has limited attention and may need to focus on some parts of the effort more than others. Since subunits providing core components can make decisions that require many other subunits to change, we would expect that these subunits would need to be monitored and controlled more closely than subunits producing peripheral ones. Thus, we would expect the following:

> *Assertion 2: Reporting to the innovating manager is more effective for subunits providing core components than for subunits providing more peripheral components.*

Assertion 2 is logically independent of Assertion 1. Various combinations of subunit separation and reporting can be envisioned, depending on the levels of NCA and coreness in each component. These are described in more detail in the methods section.

2.3.3 The Ideal Organizational Profile for an Innovation

Given the theoretical assertions built above, we are now ready to construct an idealized design for the innovating organization, based on characteristics of the innovation's components. According to Assertions 1 and 2, the structure for each subunit can be characterized by the NCA and coreness of the component that it produces. Thus, the ideal profile for the innovating organization will be a mix of differentiated subunits for new competencies, less-differentiated units to make use of existing competencies, and loose or tight reporting relationships to enable effective integration. Innovating organizations that match this ideal design profile should encounter lower levels of inertia, higher benefit from leveraging existing capabilities, and lower coordination difficulties than organizations that do not.

> *Hypothesis 1: Innovating organizations that are more closely aligned with the ideal profile (as defined by assertions 1 and 2) will outperform those that are less closely aligned.*

3 METHODS

Electronic commerce was chosen as a research context for several reasons. First, e-commerce was a shock to the retail industry, requiring new competencies in several components of the retail value chain. Nearly every firm in the retail industry undertook some action to address the innovation, with varying levels of success. E-commerce was discontinuous in several senses. Christensen and Tedlow (2000) called it a disruptive technology, which is one of the most difficult types of innovations for incumbent firms to adopt. Additionally, e-commerce has many characteristics of an architectural innovation (Henderson and Clark 1990). That is, it retains the basic components of the sales process, while rearranging and replacing others. For example, sales happen through a Website and mail rather than through stores or catalogs. Merchandising, marketing, and logistics concepts remain useful, but require changes. Finally, e-commerce disrupts the existing performance trajectory for retail by changing prices and/or convenience characteristics.

Second, e-commerce is an example of an IT-enabled innovation that has had profound effects on retail firms. It affects all three cores of an organization (Swanson 1994). Third, since the innovation was recent, it was possible to gain access to managers who were interested in the innovation and who had fresh recollection of the recent history of the innovative attempts in their firms.

Fourth, e-commerce has components that are well-defined and for which organizational subunits are relatively clearly identifiable (see Table 1). These were identified through extensive reading in the trade press, as well as consultation with several retailers, the National Retail Federation, and the e-business practice of a global strategic consulting firm. The components were clear to the retailers. Every e-business manager interviewed for the study could define how he or she had approached the development of each of these components. All firms had attempted to build each component into their e-businesses.

Table 1. Major Components of a Business-to-Consumer E-Business

Component	Description
Direct Marketing	Gathering and managing customer data and then conducting marketing campaigns that directly target individual new and potential customers
Other Marketing	Conducting market research and conducting campaigns aimed at classes of new or existing customers, but without being targeted directly to individuals. This is often called Advertising and Promotion.
Fulfillment	Picking, wrapping, and shipping products to fill customer orders.
Merchandising	Determining the assortment of items and styles to be sold in the e-business
Site Development	Developing and maintaining information technologies to keep the e-business running.
Customer Service	Handling customer inquiries about the business or specific orders. Can also include taking orders. Customer service for e-business can be performed by phone or e-mail.

3.1 Sample and Data Collection Methodology

The study uses multiple methods to gather organizational and performance information for the retailers. Performance information was gathered separately from organizational information. Organizational information was gathered and cross-checked using two methods: interviews and questionnaires. Together, the data collection methods reduce common-methods bias, thus increasing their potential reliability.

All respondents were part of a benchmarking study performed by a major retail trade association in the spring of 2001. In this confidential benchmarking study, retailers agreed to provide financial and operational data for their e-businesses in return for preferential access to the finished report.

In the summer 2001, access to the participant list was negotiated and, with the support of the trade association, each participant was contacted. In all, 47 of 96 firms agreed to be interviewed, for a response rate of 49 percent. After removing firms which were very small (under $5 million annual sales), a questionnaire was sent to 42 firms. After extensive followup, 36 respondents returned the questionnaire, yielding a response rate of 86 percent for the surveyed subsample, or 38 percent on the larger sample. In all cases, the interviewee or respondent was either the leader of the e-commerce division or a direct report. All information was gathered under a guarantee of confidentiality, including signing nondisclosure agreements where requested.

3.2 Measures

There were four major categories of measures in this study. They include e-business performance, structure of the e-business organization, characteristics of the innovation's components, and controls.

3.2.1 E-Business Performance

This study uses a single measure of performance, namely *Sales00*. This is the firm's revenue in the Internet sales channel for the calendar year 2000. Note that this is revenue pertaining to the innovation itself, not to the company as a whole. It avoids the potentially confounding effects of using firm-level measures to understand the effects of business-unit-level activity. Using this direct measure of e-business performance avoids some issues with proxy measures, such as abnormal stock market returns or Internet traffic, that are used in many other studies of electronic commerce (see, for example, Subramani and Walden 2001).

While not perfect, e-business revenue is a well-accepted, relatively unambiguous, unidimensional measure that can be compared easily across firms.[1]

3.2.2 Structure of the E-Business Organization

Questionnaire respondents described two dimensions of organization structure for each of the six components of an e-business (see Table 1). These two aspects corresponded to the two major organization design constructs described earlier in the theory section of this paper.

The first measure, *separate subunit*, was a single-item scale indicating the extent to which the people performing a function for the e-business were separate from the staff doing similar functions offline. If the exact same people performed the component activity both online and offline, respondents coded a 1. If they were completely different, or if there was no similar function offline, respondents coded a 5. All five points on the scale were clearly defined, and the questions were immediately preceded by a short definition of what each component was and was not.

The second measure, *reporting*, indicated whether the subunit performing a component activity reported to the e-business manager or to an offline manager. Respondents coded the function as a 1 if it reported to an offline manager, a 3 if it reported to the e-business manager, or a 2 if it reported to the e-business manager via a "dotted line" relationship.

Together, these measures localize the subunit performing each e-commerce activity in organization design space. For each of the six component activities, each managers' answers were compared to the notes from the interview. In the few cases where there was a major difference between questionnaire and interview, the manager was contacted to resolve the difficulty.

3.2.3 Characteristics of Each E-Business Component

The study hypothesized that two characteristics of each e-business component (*new competence acquisition* and *coreness*) would drive the appropriate design for the e-business organization. These two innovation characteristics were defined earlier in this paper. Measures were constructed from questionnaire and interview data, and verified with industry experts.

Note that firms with catalog capability had many competencies that non-catalog firms did not. For example, catalog-related fulfillment capabilities were directly applicable to e-business. Catalog-related customer service and direct marketing capabilities could be applied to e-business, but required some modifications to deal with e-mail and Internet rather than phone and mail. Therefore, component characteristics were coded separately for catalog-capable and non-catalog-capable firms.

New Competence Acquisition Requirement. The first measure, *new competence acquisition* is the extent to which the component requires competencies that do not currently exist in the firm. This was coded from interview and questionnaire data. A coding of low means that existing competencies for the component could be used with little change. Moderate signified that existing competencies for a component could be used with only modular changes. High signified that the component required non-modular changes or extensive new competencies. That is, the changes went beyond simple substitution of steps at the end of processes and involved fundamentally reworking the processes, skills and infrastructure for the component. For details on the NCA coding process, see Appendix A and Westerman (2002).

Coreness. The second measure relating to each component in the innovation is *coreness*. This is the extent to which changes in the focal component ripple through to other components in the system. For this study, the measure of coreness was derived from a set of six similar questions, one for each component. Each question asked the extent to which a major change in a focal e-business activity required nontrivial changes to occur in other activities of the e-business. These questions together formed a 6×6 non-symmetric matrix that described the interactions between components:

[1]The use of revenue as a performance measure is common practice in the study of technology strategy and incumbent adaptation. Many researchers use market share or revenues in a particular product category as an indication of innovating performance. While the current study did not specifically examine profitability of each e-business, it initially controlled for what was expected to be a major driver of revenues, namely marketing spending. The control for marketing was nonsignificant and was dropped from the results presented here.

$I_{jk} \equiv$ 1 *if component j drives change in component k,*
0 *otherwise*

For each firm, a coreness value for each component j was computed from the matrix I_{jk} using the following formula:

$$C_j = \Sigma I_{jk} - \Sigma I_{kj}, \ \forall k = 1..6$$

In words, Cj represents the extent to which the focal component j drives more change in the system than it receives.

The coreness values for each component were averaged separately for the catalog-capable and non-catalog-capable subsets of firms and then compared. Since there was little difference in coreness assessments across the two subsets, the data were averaged across the whole sample to generate a single coreness value for each component.

Table 2 shows the NCA and coreness values derived in this study. These were used to define the ideal e-business organization structure, as described below.

Table 2. Coreness and NCA for Each E-Business Component

Component	Coreness (all firms)	NCA (Catalog firms)	NCA (Non-catalog)
Direct Marketing	Core	Moderate	High
Other Marketing	Core	Moderate	Moderate
Fulfillment	Peripheral	Low	High
Site Development	Peripheral	High	High
Merchandising	Core	Moderate	Moderate
Customer Service	Peripheral	Moderate	High

3.3 Developing the Ideal Organizational Profile for E-Business

Ideally, an empirical test would examine the link between subunit level structure and innovation performance for each subunit in the innovating organization. However, such a test was not possible in this context. First, the innovating structures form a type of configuration in which organizational choices were highly correlated. Untangling the intercorrelations would have required a test with orders of magnitude more degrees of freedom than the sample possessed. Since the information required for this study was extremely sensitive to participants and, therefore, very difficult to obtain, the larger-sample analysis approach could not be chosen.

Instead, the method of ideal profile deviation was used to test the hypotheses. Ideal profile deviation is a well-respected method of testing the relationship between multidimensional configurations and performance (Venkatraman and Prescott 1990). It is valuable for examining effects of non-orthogonal dimensions of a problem, such as subunit-level interactions between independent variables (Van de Ven and Drazin 1985).

In order to build the ideal profile, information about the NCA and coreness of each component was mapped to the structural characteristics of the corresponding subunit, using assertions 1 and 2. Components with low amounts of NCA could use existing subunits. Those with more NCA needed separate subunits, either within the existing organization or completely separate (see Table 3).

For example, non-catalog firms had little direct marketing capability when e-business began. They needed to *build* new subunits (or acquire, partner, or outsource) in order to undertake direct marketing with their customers. On the other hand, catalog firms could make use of their existing fulfillment capabilities with virtually no change. They could *use* existing distribution centers intact.

Table 3. Ideal Profile for the E-Business, by Component, for Firms With and Without Catalog

	Catalog Firms		Non-Catalog	
Component	**Subunit Form**	**Reporting**	**Subunit Form**	**Reporting**
Direct Marketing	Adapt	Dotted to New	Build/Acquire	New
Other Marketing	Adapt	Dotted to New	Adapt	Dotted to New
Fulfillment	Use	Old	Build/Acquire	New
Site Development	Build/Acquire	New	Build/Acquire	New
Merchandising	Adapt	Dotted to New	Adapt	Dotted to New
Customer Service	Adapt	Old	Build/Acquire	New

Note: Subunit Form is defined as:
- Use: Activity for the e-business is performed by the same subunit as in the existing business
- Adapt: New subunit within existing subunit
- Build/Acquire: entirely new subunit for the activity in the e-business

The *adapt* case is a bit more complex. Consider catalog customer service, which had some useful competencies, but could not be used directly in e-mail customer support for e-business. It needed to be adapted for use in e-business. Several managers described the situation where, "*Some of my best phone reps can't type a coherent sentence to save their lives.*" This gave rise to the e-customer service representative (eCSR): a small subunit of customer service representatives who were trained in the use of the Website and handled all e-mail communications with customers. The e-CSRs often sat with other customer service representatives and even used the same problem tracking systems, but they had additional skills, processes and infrastructure for the e-business and e-mail task.

The ideal reporting structure was driven by the coreness of the component. Subunits producing peripheral components reported to offline management, except in the Build/Acquire case, where they reported to the e-business manager by default. Subunits producing core components reported to the e-business manager for the *build/acquire* case and had a dotted line relationship[2] to the e-business manager for the *use* and *adapt* cases.

Two separate ideal profiles were developed: one for firms with catalog capability, and one for those without. As Table 3 showed, the ideal profiles for each type of firm were actually two vectors specifying the ideal subunit separation and reporting relationship for each component activity. The structure and reporting dimensions of each component in the ideal profiles were then coded to match the coding scheme in the respondents' questionnaire in order to facilitate hypothesis testing.

3.4 Hypothesis Testing

Testing ideal profile variation requires a measure of the deviation from the ideal profile. Finding a significant negative relationship between profile deviation and performance would serve as empirical evidence in support of the theoretical model. Firms whose innovating structures were more closely aligned with the ideal profile would have smaller deviations and would be expected to have higher levels of innovating performance, on average.

To test the hypotheses, two measures of profile deviation were developed.

$$R_{align} = - \Sigma \left| Ra_j - Ri_j \right|$$
$$S_{align} = - \Sigma \left| Sa_j - Si_j \right|$$

[2]Theoretically and practically, it is extremely difficult for a subunit located in one organizational unit to report solely to another part of the organization. The dotted-line relationship signifies close supervision of a subunit that the e-business manager did not explicitly own.

where Ra and Sa are the actual reporting and subunit values for each subunit *j* (from the questionnaire) and Ri and Si are the ideal values.

R_{align} and S_{align} are measures of the extent to which the actual organizational structure for a given firm matches the ideal. A value of zero signifies perfect alignment. Increasing deviation from the ideal is represented by increasingly negative values. These measures were computed for each firm, using either the catalog or non-catalog ideal profile depending on whether the firm had a catalog business with more than $5 million in annual revenues prior to launching e-commerce.[3]

Once the alignment variables S_{align} and R_{align} were computed for each firm, hypothesis testing was straightforward. I used a simple OLS regression of the form:[4]

$$\log_{10}\text{Sales} = \beta_0 + \beta_1 S_{align} + \beta_2 R_{align} + \beta_3 \log_{10}\text{Size} + \beta_4 \text{TimeOnline} + \beta_5 \text{Cat-Only} + \beta_6 \text{Cat-Store} + \varepsilon$$

where the control variables were defined as:

- Log10Size: Common logarithm of total firm revenues in FY2000
- TimeOnline: Number of months between first online transaction and the end of December 2000
- Cat-Only: Dummy denoting firms that had only catalogs prior to e-business
- Cat-Store: Dummy denoting firms that had both catalogs and stores prior to e-business

4 RESULTS

Table 4 shows descriptive statistics for the sample. There is a wide variation in firm size and online revenues. The sample includes both large and small retailers, with some bias toward larger firms.[5] Table 5 shows the intercorrelations between the measures.

Table 4. Descriptive Statistics for the Sample

	N	Mean	Standard Deviation
L10Sales	36	7.12	0.79
L10Size	36	8.82	0.91
TimeOnline	36	31.4	19.9
Salign	36	-6.17	3.53
Ralign	36	-3.67	1.64

[3]The $5 million threshold was suggested by retail experts as an order volume that required structured processes and infrastructure that could constitute a valuable catalog capability.

[4]The model uses log-transformed measures for Sales00 and firm size. The log transformation is appropriate if we assume that e-businesses will not scale linearly with firm size. That is, we would not expect a $10 billion retailer to be able to scale its e-business to 5 percent of firm size ($500 million) in the same amount of time that a $100 million retailer could scale an e-business to 5 percent ($5 million).

[5]At least 25 percent of the 36 firms in the sample are in the top 100 retailers, according to any of the three top 100 lists of retailers published by Stores Magazine and Catalog Age.

Table 5. Correlation Matrix

	L10Sales	L10Size	TimeOnline	Salign
L10Size	0.7220***			
TimeOnline	0.2452	-0.1855		
Salign	0.4375**	0.6108***	-0.1126	
Ralign	0.0028	-0.1212	0.0149	0.2862+

+p < .10, *p < .05, **p < .01, ***p < .001

Table 6 summarizes the results of the OLS regressions. Models 1 and 2 show that two controls (L10Size and TimeOnline) significantly explain a large percentage of the variance in online revenues. This is to be expected. Size can be considered a proxy for latent resources, such as customer base and brand capital, that were not measured directly in the model. Additionally, firms that have been online longer can be expected to have higher percentages of returning customers and more streamlined processes as a result of ongoing learning.

Model 3 shows the effect of ex ante catalog capability. Firms with catalog capability, as represented by the two dummy variables cat-only and cat-store, have significantly higher revenues than non-catalog-capable firms, after controlling for firm size and time online. This supports the study's implicit assumption that catalog-related capabilities are useful for e-commerce.

Models 4 through 6 test the effect of organizational alignment on e-business performance. Together, they provide strong support for hypothesis 1 and its constituent assertions. Individually, R_{align} and S_{align} are significantly associated with performance.[6] In Model 6, both measures remain significant. This suggests that both alignment measures, while correlated, are independently associated with innovation performance.

Table 6. OLS Regression Results

	1	2	3	4	5	6
N	**36**	**36**	**36**	**36**	**36**	**36**
Adj R^2	0.5072	0.6502	0.7355	0.7766	0.7784	0.7957
L10Size	0.7220***	0.7948***	0.9214***	0.7790***	0.9680***	0.8511***
TimeOnline		0.3927***	0.2886**	0.2373*	0.2593**	0.2286*
Cat-Only			0.3893**	0.5620***	0.4710***	0.5787***
Cat-Store			0.2419*	0.3711***	0.3341**	0.4070***
Salign				0.3180**		0.2353*
Ralign					0.2282**	0.1719*

Standardized betas from OLS regression using Log10 (Online Revenues).
+p < 0.10, *p < 0.05, ** p < 0.01, *** p < 0.001 (One-tailed for Ralign and Salign. Two-tailed for all others)

[6] The hypothesis test for alignment is directional. Any deviation from ideal is expected to be associated with poorer performance. As operationalized, deviation from ideal in any direction counts as a negative alignment. Therefore, a one-tailed test is appropriate for S_{align} and R_{align}.

5 DISCUSSION

The study helps to resolve an important debate about organizing to adopt discontinuous innovations. Both the advocates of separation and the advocates of integration are partially correct. The debate can be resolved by examining a more detailed level of analysis. If structural contingencies can differ across subunits in an organization, then why would an all-or-nothing prescription apply to designing an innovating organization? Similarly, while some skills, processes, and infrastructure may be useful in the innovation, some may hinder innovation. So, why try to make organizational recommendations based on the innovation as a whole?

When considering the innovation as a set of components and linkages, we can make a direct mapping to organization design. Well-known attributes of components map to well-known contingencies and thus to characteristics of subunit-level organization design. The innovating organization is neither entirely separate, nor entirely integrated. Instead, it is a hybrid of new subunits and existing subunits, reporting either to the innovating manager or the existing management, according to a simple set of rules. Inertia is reduced by making use of new subunits where new competence acquisition is required. However, the new subunit need not be completely separate from similar groups in the existing organization. Components requiring high levels of NCA are produced in new subunits, in order to gain focus and speed for adoption as well as to avoid the inertial effects of requiring existing subunits to learn completely new ways of working. Components with moderate amounts of new competence acquisition are developed in new subunits within existing subunits. In that way, they can attain speed and focus, and avoid some inertia, while making use of resources that remain valuable.

The model generates a clear set of guidelines for mixing bricks and clicks. An e-business can make use of an existing bundle of competence, even if a moderate amount of change is necessary, by using the *use* or *adapt* structure. The e-business manager need not control all activities; only those that provide core components. Using these decision rules, an e-business may be able to move powerfully by leveraging the firm's competitive position and resources while avoiding the inertial influences often cited as a cause of failure to innovate.

The study is, of course, limited. It examines a single innovation in a relatively small number of firms. The in-depth detailed information used in this study is very difficult to obtain. Having it makes the study's findings more clear and powerful. However, attempting to use this type of detail also limits the number of firms willing to participate. In the end, the measures give statistically significant results and explain a high degree of variance. Given the goal of the study, namely to propose a new model of organizing, the data provide an interesting initial test. Future studies should replicate the results in a much larger sample (if possible given the sensitivity and difficulties of collecting this kind of detailed internal information).

Despite these limitations, the theory and findings should be applicable beyond the e-business context. Most notable is the application to information technology adoption and development. The model could be used in determining the structure of development teams. It could also help to guide ownership decisions in IT governance and IT infrastructure contexts. More broadly, the study has important implications for technology strategy in general. It suggests that, even in times of tremendous technological change, the ability to effectively make use of existing capabilities is an important driver of competitive advantage. Firms need not spin off independent units to pursue discontinuous innovations. In fact, doing so may prevent the firm from effectively making use of valuable capabilities it already possesses. A more powerful approach is to design an innovating organization that can effectively build new capabilities while simultaneously leveraging the old. The model developed and tested in this paper provides useful guidance in doing so.

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Appendix A
Coding NCA for Each E-Business Component

New competence acquisition (NCA) was coded for each e-business component as follows. Interview and questionnaire data were used to code four characteristics of the activity. These included:

- extent of process change
- requirement for new infrastructure
- change to individual workers' skills
- change to management processes

Each characteristic received a value between 0 and 3 representing the degree to which this characteristic required change (see Table A1).

Table A1. Coding the Extent of Change for One Characteristic of a Component

Extent of "process change" to the component competence	Value coded for "process change"
No change (or trivial change) to existing process	0
Modular change, meaning that process steps at the beginning or end of the process may be new or modified, but that there were no changes to the central steps in the process.	1
Non-modular change, meaning that there were nontrivial changes to the central process steps.	2
Totally new (or almost totally new) process	3

Once all four characteristics of the component were coded, the component itself received an NCA coding based on the rules in Table A2. If nearly all characteristics required minimal change, the component was coded as *low NCA*. If nearly all changes were modular, the component was coded as *moderate NCA*. Changes in these components were limited to simple additions or subtractions to skills, infrastructure, or processes. Finally, when change was more extensive, meaning that it could not be done in a modular fashion, the component was coded as *high NCA*. This meant that it required totally new or substantially reworked skills, processes, or infrastructure.

Table A2. Coding NCA for Each E-Business Component

Extent of change in the component	NCA requirement for the component
Minimal Change: At most one characteristic of the component had a value of 1 or higher	LOW
Modular Change: At most one characteristic of the component had a value of 2 or higher	MODERATE
Non-Modular Change: More severe change in more than one characteristic of the component	HIGH

As an example, consider the changes necessary to convert a non-catalog firm's distribution center processes for e-commerce. In the typical retail firm that does not have catalog capability, the inventory management system creates an order in a distribution center to replenish each store on a regular basis. Filling these orders typically requires picking cartons of items from bins in the warehouse, then placing them in a special shipping crate and loading them onto a truck for delivery.

E-commerce requires both modular and non-modular changes to fulfillment. First, there is a set of modular changes:

- The Website inserts orders into the distribution center's order processing system.
- The distribution center staff (or the conveyors in the distribution center) route the crates to a special spur, where they are wrapped, weighed, and addressed for shipping by mail or other type of carrier.

These changes are simple additions and subtractions to the processes, staffing, and infrastructure for fulfillment. Neither requires a change to the central process steps of the distribution center.

Unfortunately, there is also a set of non-modular changes. For example, e-commerce orders tend to demand products in "eaches" rather than cartons. That is, a single mauve lipstick, rather than a whole box of them. Filling e-commerce orders often means changing the picking process to open cartons, find places to store partially-empty cartons, ensure that workers check for opened cartons before opening new ones, and keep track of partial cartons of inventory.

These are not simple modular changes to the ends of the process, but rather require fundamental rework. That is, there are non-modular changes to the process, the infrastructure, workers' skills, and possibly the management processes. Since more than one of fulfillment's characteristics required non-modular change, fulfillment was coded as HIGH NCA for non-catalog firms.

Note that NCA was computed separately for catalog and non-catalog-capable firms, since the two types of firms had different sets of capabilities *ex ante*.