Exploratory analysis on the halo effect of strategic goals on IOS effectiveness evaluation

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Abstract

How do managers evaluate the effectiveness of IT use? Past literature showed that the assessment of IT effectiveness is not straightforward, especially when viewed in terms of “business outcomes,” such as sales increase, firm profitability, and firm success. For inter-organizational systems (IOS), IT effectiveness evaluation is even more challenging, because these IOS are an integral part of a retail channel distribution system where several factors can influence business outcomes. Under such circumstances, IOS effectiveness evaluation is prone to a halo effect. A survey of retailers and suppliers showed that firms favorably judge IOS as long as their strategic goals are met, even when they do not recognize any IOS contribution towards accomplishing them. Conversely, IOS use was not appreciated when strategic goals were not met—even if IOS use benefits the firm at the operational or tactical level. In effect, IOS evaluation was overshadowed by the halo effects of strategic goal accomplishment. © 2004 Elsevier B.V. All rights reserved.

Keywords: Effectiveness evaluation; Halo effects; Strategic goal accomplishments; Interorganizational systems (IOS); Electronic data interchange (EDI)

1. Introduction

While the impact of IT use on organizational performance has been a major research focus, past studies “have provided findings that tend to be either mixed or inconclusive . . .” because “the effects of IT are indirect . . .” and “IT is a moderator of organizational characteristics and processes” [23]. For example, one may find a direct link between office IT use and office work productivity, but the IT use may not translate into business unit success in terms of operational cost reductions, revenue increases, or business goal accomplishments.

The strategic value of interorganizational systems (IOS) has been well recognized for order entry and distribution [18], just-in-time (JIT) manufacturing [56], reservation systems [43], quick response [29], and vendor managed inventory (VMI) [30]. An interesting case is efficient consumer response (ECR)—an IT-enabled industry-wide supply-chain initiative that started in the early 1990s in US grocery distribution channels. ECR has received reports of “growing industry dissatisfaction in the [US] trade press” [9],

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though positive reports exist [31,36]. ECR had “fallen far short of its promised efficiencies and value” primarily because the industry expectation exceeded the reality [25]. Then, how do firms assess IOS, the key enabler of initiatives like ECR, when their business expectations and business outcomes do not coincide?

The adoption of IOS generally requires substantial commitments of both financial and operational resources. While such commitments indicate a firm’s faith in the ability of IOS to help achieve its strategic goals, not all firms share the same level of “faith.” Some see the situation differently because their trading partners or market conditions have mandated such resource commitments. Sometimes the results from IOS do not make significant strategic contributions [19,41]. Furthermore, unlike systems used only in one firm, IOS are used with multiple trading partners. How does a retailer evaluate its IOS when its benefits differ with various suppliers? It usually requires a judgment call on how much IOS contributes to the accomplishment of favorable retailing business results when considering the impact on one trading partner.

Thus, the business evaluation of IOS use is neither simple nor straightforward. There are criteria on effectiveness, such as the gains in operational efficiency from various retail distribution processes, the reduction of operational personnel and/or their time, and product sales increase due to more timely and accurate market information. There are also factors that can either limit IOS use and any resulting effectiveness; these include general market conditions, the number and quality of competitors, and the firm’s management skills.

Given such an “ambiguous” link between IOS use and business goal accomplishments, our study examines whether a halo effect exists (or even pervades) when evaluating IOS. A halo effect is a strong overall impression that blurs distinctions between dimensions or attributes [10]. For example, our first impression of a person is sometimes based on feeling about a stereotype (of the group) to which the person belongs [3].

Our question therefore is: Do firms evaluate IOS based on the status of their business goal accomplishments but not on how much IOS actually contributes to the accomplishments? To answer this question we examined the relationships between four factors—the strategic goals established for a trading relationship, the degree that each goal is achieved, IOS usage, and the perceptions of IOS effectiveness—in the context of trading relations between retailers and suppliers. By assessing these relationships, the study explored whether and how IOS are “fairly” evaluated by retailers and suppliers. Also the study explored whether and how their views were different.

At the outset, it should be noted that this is an exploratory study based on a cross-sectional survey with limited sample sizes. Also, the survey data were collected in late 1998 and this limits the generalization of the research findings. However the results of our research did not depend on the “currency” of the IOS technologies used.

2. Research background

Studies of IS effectiveness are rooted in those of IS success. Delone and McLean [22] summarized the fundamental measures of IS success as systems quality, information quality, use, user satisfaction, individual impact, and organizational impact. Yet while these measures are the direct results of IS use, we face ambiguities when we evaluate IS success against the degree that strategic goals are realized.

Dewett and Jones reviewed and summarized a broad array of IT impact literature, and their study gave us insight into such ambiguities. They pointed out several confounding factors of IT impact assessment on organizational performance, upon which strategic goals usually are evaluated. Such factors include:

(a) IT as a moderator of business process.
(b) IT impact appearing across adopting firms.
(c) Interaction between IT and an individual firm.
(d) The manner of IT implementation.

One of the prominent examples of ambiguity was the so-called “IT productivity paradox” where the financial return from an IT investment did not seem proportional to the investment in IT [40]. In addition, each IS application had a different potentiality for influencing straightforward cost/benefit measurements [24].

The evaluation of IOS on strategic goals is even more challenging because IOS are used by multiple partners. Whereas past studies on operational efficiency gains showed positive results [47,53], those on trading relationships were mixed [6,17,33,58].
first group of studies reported that IOS use increased information accuracy and timeliness and increased certain domains of operational efficiencies, such as replenishment and production cycle times. The second group indicated that more cooperation could result from the availability of accurate and timely information, while firms experienced some conflict due to information asymmetry and perceived unbalance, but none the less realized benefits from their IOS.

If the ambiguity factors make the impact of IOS less visible, then how “fair” are the IOS evaluations? When there is a high level of goal accomplishment, there is one possible moderating factor: the halo effect, where one aspect (goal accomplishment) overshadowed other dimensions or attributes (e.g., IOS evaluation).

Halo effects have frequently been researched in the fields of psychology (assessment), marketing (consumer decision making), and management (performance ratings), e.g. [2,39,34]. IS studies on such effects have only been made recently. While Bharadwaj [5] did not find one, Santhanam and Hartono [54] did, in assessing firms’ IT capabilities through their prior financial performance. Both studies applied what Brown and Perry identified as the halo effects in evaluating a firm’s financial performance; a firm with better previous financial records tended to receive more favorable evaluation in such survey-based ratings as Fortune’s “most admired corporations.” Santhanam and Hartono showed that between a firm with a previous record of superior financial performance and a firm with a prior poor financial performance, the former got a higher rating on its IT capabilities, even though they were the same.

An interesting question is whether positive strategic goal accomplishment results in a halo effect that overshadows a fair assessment of IOS contribution to goal accomplishments.

The possibility of haloed evaluations comes not only from ambiguities in assessing effectiveness but also from what marketing studies call “post-purchase behavior.” This phenomenon includes the need to justify past purchases [26] and cognitive biases that support previously held expectations [51]. Are we more likely to see biased evaluations when a firm has increased its strategic goals and made substantial investments in IOS?

3. Research framework and hypotheses

This study formulated hypotheses on the relationships between four factors: strategic goals, IOS use, goal accomplishments, and IOS effectiveness evaluation (see Fig. 1). In the model, the existence of the halo effects was evaluated in three different ways:

(a) Whether the path between goal accomplishments and IOS effectiveness evaluation was significant while the path between IOS use and goal accomplishments was not or was only marginal (a halo based on the level of goal accomplishments).
(b) Whether the path between strategic goals and IOS effectiveness evaluation was significant (a halo based on the importance of strategic goals).
(c) Whether the path between IOS use and IOS effectiveness evaluation was significant (a halo from IOS use itself).

The importance of a firm’s strategic goals leads to the decisions to commit resources for payback. Past research suggested that the importance attached to the strategic goals influenced the level of commitment, both within a firm [28] and between firms [11].

For example, gaining local market share is a significant strategic goal for a retailing chain that has just opened stores in an important new market and this chain wants to invest in IOS to coordinate operations with suppliers (i.e. implement B2B e-commerce). The retailer also hopes to realize well-coordinated, IT-facilitated product sales promotions to attract new customers. When the retailer becomes an established local market leader, it still desires to invest with its major suppliers to contain distribution costs and maximize market intelligence. Towards these ends, the retailing chain wants to apply data mining to explore sales opportunities and to find better ways to compete against other retailing chains.

Past research on EDI systems indicated that the critical factors for its adoption included a proactive technological orientation and an internal push [27], the relative advantages of the new system [49], and competitive pressures as well as internal needs [50].

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2 Post-purchase behaviors can be seen at both personal and group levels.
Thus, the firm’s commitment to IOS depended on the firm’s strategic position in the channel as well as its strategic goals.

Thus, IOS use is driven by the importance of strategic goals.

**H1**: (Higher levels of strategic goals will lead to the higher levels of IOS use). Other studies have reported on critical improvements from using EDI, resulting in greater operational efficiency and gains in strategic advantage. Such studies have covered: the facilitation of customer services at a French distributor of office supplies and products [37], administrative/operational efficiency and strategic advantages at various Canadian firms [8], the summary of EDI impact and strategic values in selected industries [21], and economic benefits from improved information exchanges between an American automobile manufacturer and its suppliers [44]. All these pointed out that firms adopted IOS to gain, or at least help achieve, strategic goals. Thus, although the value of IT may not always result in financial returns (the IT productivity paradox), past studies revealed that IOS use brought positive operational and managerial results.

**H2**: (Higher levels of IOS use will lead to some higher levels of goal accomplishments). If current goals were indeed accomplished, then the effectiveness of IOS was assessed more favorably. Perceived product performance was the most powerful determinant of customer satisfaction [48].

**H3**: (Higher goal accomplishments will lead to more favorable evaluations of IOS effectiveness). If H3 should hold but H2 be rejected, the first type of halo effect would be confirmed. Firms would have attributed IOS to goal accomplishments merely because they were accomplished and they had not seen whether or how the IOS helped.

Although there have been few studies in the context of IS, there has been some evidence that the importance of goals biases the evaluation of IT effectiveness in two ways. The first stems from management’s inclination to justify its commitment to IOS adoption. The second is the fact that goal accomplishment has occasionally been impacted by other aspects, such as general market conditions.

Using cognitive dissonance theory, Geva and Goldman showed that we try to justify past purchase behaviors to minimize any gap between prior and post product perceptions. Rabin and Schrag similarly reported people’s tendency to misinterpret new information in order to rationalize past decisions.

While the unit of analysis was the individual in previous studies, “we can also speak of the logic of action as a group phenomenon” [4]. For example, when making IOS adoption decisions, management is faced with justifying its commitments. Organizational units that play key roles in adopting IOS are subject to similar group psychological phenomena because they are stakeholders. Thus, our study hypothesized that management tried to rationalize its commitment to adopt expensive IOS.

The second factor to consider was the causal ambiguity between IOS use and IT effectiveness. The use of IOS directly impacted some strategic goals, such as operational efficiency gains that lower distribution costs. However, when a firm’s strategy was to gain market share, the firm did not fully accomplish that goal even with operational efficiency gains. For example, EDI systems facilitated faster and more responsive product distribution. When gaining market share was the primary goal, this might not have been
accomplished because the firm’s competitors used similar IT systems with more aggressive pricing tactics. Under such circumstances, the firm faced a situation where it had committed its resources to IOS, it saw some gains on important goals, but it was not certain how much credit it could give to IT use.

Combining the above two factors, the study hypothesized:

**H4:** (Higher levels of strategic goals will lead to the more favorable evaluations of IOS effectiveness). If H4 occurred, the second type of halo effects existed. The importance of strategic goals haloed the evaluation of IOS effectiveness.

Because IT effectiveness is not determined by the presence of IT systems per se but by the motivation (strategic goals) behind IT use—these two factors form the basis of cognitive dissonance at the managerial level.

**H5:** (Higher levels of IOS use will lead to a more favorable evaluation of IOS effectiveness). If H5 is supported, the mere presence of IOS itself has biased IOS effectiveness evaluation, be it positively or negatively. This would then be a third type of halo effect.

### 4. Research method

We collected data from retailers and suppliers through a mail survey in late 1998. The hypotheses were then tested using path analyses, because they allow us to test not only the relationship between individual variables but also the pattern of these relationships. Thus, we could construct and test the various models of possible causal relationships based on theoretical considerations.

#### 4.1. Data collection and analyses

The unit of analysis was the individual firm. Each retailer (or supplier) assessed: how it evaluated the degree to which it attained its strategic goals, and then how it evaluated the level that IOS contributed towards attaining each strategic goal.

The retailing sector in the US consists of more than one million establishments with diverse retailing business categories, ranging from building materials, garden supplies, restaurants, drug stores, and numerous retail stores. For selecting the sampling population, the study used two criteria. First, within the sampling population, some firms used IOS extensively. Thus we could assess the relations between the extent of IOS use and the firm’s evaluation of IT effectiveness. Second, within the sampling population, the majority of retailers did not heavily depend upon one or two suppliers, so the retailers had discretion in IOS use. The suppliers sampled, in turn, did not depend on one or two individual retailers. Thus, the relative channel power of the parties was not skewed.

IOS require significant investments. As a result, the retailing industry has had a slower-than-expected penetration of IOS—notably even with the availability of extranets and web-based EDI [42,55]. Thus, our study avoided firms with annual sales of US$ 1M or less, simply because they were not likely to make a commitment to IOS. In addition, the questionnaire asked respondents to limit their answers to their relations with their top trading partner, based on dollar transaction volume.

Furthermore, the study excluded automobile dealers, apparel and accessory stores, and restaurants for two reasons. First, Vijayasarathy and Robey’s survey indicates very low levels of IOS use in those market segments. Second, retail sectors like automobile dealers usually work as representatives of their suppliers, and their IT use with supplier is generally dictated by the supplier. In contrast, supermarket chains sell 10,000–50,000 store keeping units (SKUs) of merchandise. As a result, their survival rarely depends on a single supplier.

Finally, we were concerned with the low response rates for unsolicited mail surveys. Therefore, data were collected from a survey to the member firms of

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3 The number is based on the 1997 US Economic Census data. The next updated count will be available in 2007.

4 According to a 2001 survey by KPMG, the most common information sharing methods of US retailers with their vendors were telephone (82%), fax (77%), email (70%), EDI (38%), Internet (29%), systems integration (23%) [12].

5 Roughly 80% of the purchases result from fewer than 30 suppliers.

6 As of the mid 1990s, the response rates for unsolicited mail surveys included 6% of a CIO survey [35], 5% of a IS manager survey [57], and 6–7% of field survey data for an IS project management study [46].
national-level, retailer trade associations. We used a cover letter from the associations endorsing the survey in an attempt to improve the response rate. These associations were: National Association of Chain Drug Stores (NACDS), North American Retail Dealers Association (NARDA), National Grocers Association (NGA), and Food Marketing Institute (FMI). The retailers in those associations merchandise a variety of food/non-food products (see Table 1). The contact information on the suppliers trading with those retailers was obtained only from NACDS, because this information was not available from the other retailer associations.

With their support, the study received responses from 99 survey participants in four retailing sectors: 30 chain drug stores (usable response rate of 24.3%); 32 independent, non-food retailers (14.2%); 31 independent grocers (4.2%); and 6 chain grocers (11.1%). In addition, the study had 72 NACDS member suppliers, two-thirds of which were non-pharmaceutical firms (usable response rate of 11.5%). The retailers and suppliers represented providers of products we typically purchase at large supermarkets and discount retailers like Wal-Mart and Target.

4.2. Statistical method

PLS is used to test the hypotheses (Fig. 1). Compared to other path analytical methods, PLS requires minimum demands on measurement scales, sample size, and residual distributions for the path analysis [14]. In addition, PLS allows some variable constructs to be both the latent variables whose measurement items predict or cause latent variables (formative) and are caused or predicted by the latent variables (reflective) [13,15]. Such flexibility is not available with typical path analytical methods such as LISREL and EQS.

The study followed PLS analysis and reporting procedures that have been used in recent IS studies [1,38,52,59].

PLS first estimated the weights and loadings for latent variables and then calculated path coefficients in an iterative process. Path significance levels were estimated by the bootstrap method, where the number of samples was equal to the number of sample sizes, because PLS does not directly give them. The measurement items for the reflective latent variables were discarded when their loadings were below 0.50 so that the average variance extracted (AVE) of latent variables were above 0.50 and their composite reliabilities ($r_c$) were above 0.70 (see Tables 3 and 4). For discriminate validity of latent variables, the square root of AVEs exceeded the inter-construct correlations, as seen in Tables 5 and 6. There are no definitive

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7 FMI did not provide its membership information. Instead, the information was obtained from the American Business Information (ABI).

8 Although supplier data come only from NACDS, only one-third of these suppliers are pharmaceutical firms. In addition, it should be noted that the differences of merchandised products between chain drug stores and typical supermarkets are less obvious.

9 Bootstrap sampling method selects data independently and repeatedly from the existing data till the given number of cases has been selected [7].

10 Both AVE and $r_c$ are reliability indicators for latent variables. $r_c$ measures internal consistency among measured items for latent variables. Similarly, AVE gives a measure of reliability for the latent variable component data. It tends to be more conservative than $r_c$. 

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<table>
<thead>
<tr>
<th>Retailer association</th>
<th>Member firm types</th>
</tr>
</thead>
<tbody>
<tr>
<td>NACDS</td>
<td>Chain drug stores, their suppliers in a variety of industries including healthcare products, food, beverages and office products</td>
</tr>
<tr>
<td>NARDA</td>
<td>Retailers of a variety of non-food items including appliances, home electronics, computers, furniture and audio components</td>
</tr>
<tr>
<td>NGA</td>
<td>Independent grocers</td>
</tr>
<tr>
<td>FMI</td>
<td>Chain grocers</td>
</tr>
</tbody>
</table>
Table 2
Survey respondent profile

<table>
<thead>
<tr>
<th>Job title (%)</th>
<th>Chain pharmacy (N = 30)</th>
<th>Suppliers to chain pharmacy (N = 72)</th>
<th>Non-grocery retailers (N = 32)</th>
<th>Independent grocery retailers (N = 31)</th>
<th>Chain grocery retailers (N = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior exec.</td>
<td>10.0</td>
<td>4.2</td>
<td>68.8</td>
<td>80.6</td>
<td>33.3</td>
</tr>
<tr>
<td>Sales/marketing</td>
<td>63.3</td>
<td>77.8</td>
<td>25.0</td>
<td>12.9</td>
<td>50.0</td>
</tr>
<tr>
<td>SVP, VP</td>
<td>40.0</td>
<td>41.7</td>
<td>12.5</td>
<td>6.5</td>
<td>0.0</td>
</tr>
<tr>
<td>dir., mgr.</td>
<td>23.3</td>
<td>36.1</td>
<td>12.5</td>
<td>6.5</td>
<td>50.0</td>
</tr>
<tr>
<td>MIS</td>
<td>23.3</td>
<td>18.1</td>
<td>3.1</td>
<td>6.5</td>
<td>16.7</td>
</tr>
<tr>
<td>SVP, VP</td>
<td>16.7</td>
<td>2.8</td>
<td>0.0</td>
<td>3.2</td>
<td>16.7</td>
</tr>
<tr>
<td>dir., mgr.</td>
<td>6.7</td>
<td>15.3</td>
<td>3.1</td>
<td>3.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>3.3</td>
<td>0.0</td>
<td>3.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tenure at firm (year)</td>
<td>10 or more</td>
<td>7.3</td>
<td>10 or more</td>
<td>10 or more</td>
<td>10 or more</td>
</tr>
<tr>
<td>Industry experience (year)</td>
<td>10 or more</td>
<td>7.7</td>
<td>10 or more</td>
<td>10 or more</td>
<td>10 or more</td>
</tr>
</tbody>
</table>

Table 3
Summary of PLS model variables for retailers

<table>
<thead>
<tr>
<th>Var ID</th>
<th>Item description</th>
<th>Mean</th>
<th>S.D.</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what degree are the following items your firm’s important objectives with the supplier?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic goals (GOALS), AVE = 0.65, ρc = 0.90&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STKope</td>
<td>Increasing operational efficiency</td>
<td>3.62</td>
<td>0.97</td>
<td>0.68***</td>
</tr>
<tr>
<td>STKsales</td>
<td>Increasing product sales</td>
<td>3.99</td>
<td>0.99</td>
<td>0.86***</td>
</tr>
<tr>
<td>STKmkt</td>
<td>Making marketing planning more effective</td>
<td>3.43</td>
<td>1.07</td>
<td>0.83***</td>
</tr>
<tr>
<td>STKprom</td>
<td>Increasing promotions</td>
<td>3.56</td>
<td>1.09</td>
<td>0.76***</td>
</tr>
<tr>
<td>IOS use (IOS), AVE = n/a, ρc = n/a&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDITrans</td>
<td>No. of EDI transaction sets using</td>
<td>2.68</td>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Control Variable I (CTLV1), R&lt;sup&gt;2&lt;/sup&gt; = n/a&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDIpartners</td>
<td>No. of EDI partners</td>
<td>1.82</td>
<td>1.69</td>
<td>1.00</td>
</tr>
<tr>
<td>Control Variable II (CTLV2), R&lt;sup&gt;2&lt;/sup&gt; = n/a&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FcdAdptn</td>
<td>Forced adoption</td>
<td>0.11</td>
<td>0.33</td>
<td>1.00</td>
</tr>
<tr>
<td>To what degree is your firm accomplishing the objectives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Accomplishments (ACCMP), AVE = .69, ρc = 0.92&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACope</td>
<td>Increasing operational efficiency</td>
<td>3.00</td>
<td>0.81</td>
<td>0.80***</td>
</tr>
<tr>
<td>ACSales</td>
<td>Increasing product sales</td>
<td>3.10</td>
<td>0.85</td>
<td>0.87***</td>
</tr>
<tr>
<td>ACMkt</td>
<td>Making marketing planning more effective</td>
<td>2.93</td>
<td>0.97</td>
<td>0.86***</td>
</tr>
<tr>
<td>ACprom</td>
<td>Increasing promotions</td>
<td>3.08</td>
<td>0.94</td>
<td>0.84***</td>
</tr>
<tr>
<td>ACshare</td>
<td>Increasing market share against competitors</td>
<td>2.93</td>
<td>0.99</td>
<td>0.80***</td>
</tr>
<tr>
<td>IOS Effectiveness Evaluation (IOSEFF), AVE = 0.77, ρc = 0.94&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITEope</td>
<td>Increasing operational efficiency</td>
<td>3.20</td>
<td>1.14</td>
<td>0.80***</td>
</tr>
<tr>
<td>ITEsales</td>
<td>Increasing product sales</td>
<td>2.92</td>
<td>1.06</td>
<td>0.88***</td>
</tr>
<tr>
<td>ITEmkt</td>
<td>Making marketing planning more effective</td>
<td>2.88</td>
<td>1.09</td>
<td>0.92***</td>
</tr>
<tr>
<td>ITEprom</td>
<td>Increasing promotions</td>
<td>2.67</td>
<td>1.06</td>
<td>0.88***</td>
</tr>
<tr>
<td>ITEshare</td>
<td>Increasing market share against competitors</td>
<td>2.90</td>
<td>1.13</td>
<td>0.91***</td>
</tr>
</tbody>
</table>

<sup>a</sup>x ≤ 0.10; **x ≤ 0.05; ***x ≤ 0.01; ρc, composite reliability.
<sup>a</sup> AVE: average variance extracted.
<sup>b</sup> Var type: reflective.
<sup>c</sup> Var type: formative.
criteria for the validation of formative latent variables. However, non-significant measurement items were dropped from the analyses when $R$-square was below 0.03 and/or $Q$-square predictive relevance was negative.\(^\text{11}\)

4.3. Variables

This study tracked strategic goals, goal accomplishments, and IOS effectiveness evaluation in five dimensions: increasing operational efficiency, increasing product sales, making marketing planning more effective, increasing promotions, and increasing market share against competitors. These dimensions were identified through industry literature reviews and interviews with seven executives, directors, and managers in the two pilot studies. The items were assessed using a 5-point Likert scale (none/not at all, marginal, moderate, significant, very significant). The factor analyses showed that there was only one significant factor for these five items on the dimensions of strategic goals, goal accomplishments, and IOS effectiveness. This is evident in the composite reliability ($\rho_c$) levels in Tables 3 and 4, which are counterpart of Cronbach’s $\alpha$ [20] in PLS, were all above the level of 0.90.

IOS use was assessed with the five items of Appendix A. Using the valid latent variable criteria, only the number of EDI transaction sets used was

### Table 4
Summary of PLS model variables for suppliers

<table>
<thead>
<tr>
<th>Var ID</th>
<th>Item description</th>
<th>Mean</th>
<th>S.D.</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRKope</td>
<td>Increasing operational efficiency</td>
<td>3.65</td>
<td>1.06</td>
<td>0.68***</td>
</tr>
<tr>
<td>STRKmkts</td>
<td>Increasing product sales</td>
<td>4.24</td>
<td>0.80</td>
<td>0.86***</td>
</tr>
<tr>
<td>STRKprom</td>
<td>Making marketing planning more effective</td>
<td>3.64</td>
<td>1.04</td>
<td>0.83***</td>
</tr>
<tr>
<td>STRKshare</td>
<td>Increasing market share against competitors</td>
<td>3.46</td>
<td>1.05</td>
<td>0.76***</td>
</tr>
<tr>
<td>IOS Use (IOS), AVE = n/a, $\rho_c = n/a^{b}$</td>
<td>No. of EDI transaction sets using</td>
<td>2.14</td>
<td>1.85</td>
<td>1.00</td>
</tr>
<tr>
<td>Control Variable I (CTLV1), $R^2$ = n/a</td>
<td>No. of EDI partners</td>
<td>1.75</td>
<td>1.39</td>
<td>1.00</td>
</tr>
</tbody>
</table>

| Accop      | Increasing operational efficiency                      | 3.33   | 0.90  | 0.80*** |
| Acsales    | Increasing product sales                               | 3.43   | 0.90  | 0.87*** |
| Acmkt      | Making marketing planning more effective              | 3.17   | 0.98  | 0.86*** |
| Acprom     | Increasing promotions                                  | 2.96   | 0.97  | 0.84*** |
| Acshare    | Increasing market share against competitors           | 2.89   | 1.15  | 0.80*** |

| ITEope     | Increasing operational efficiency                      | 3.39   | 1.18  | 0.80*** |
| ITEsales   | Increasing product sales                               | 2.93   | 1.15  | 0.88*** |
| ITEmkt     | Making marketing planning more effective              | 2.83   | 1.13  | 0.92*** |
| ITEprom    | Increasing promotions                                  | 2.58   | 1.20  | 0.88*** |
| ITEshare   | Increasing market share against competitors           | 2.75   | 1.34  | 0.91*** |

\(^a\) $\alpha \leq 0.10$; \(^b\) $\alpha \leq 0.05$; \(^c\) $\alpha \leq 0.01$; $\rho_c$, composite reliability.

\(^a\) AVE: average variance extracted.

\(^b\) Var type: reflective.

\(^c\) Var type: formative.

\(^11\) $Q$-square gives how well the model reconstructs observed data for a latent variable by using sample reuse technique.
entered for the variable because all the other items were not statistically significant per the PLS model. Thus significant IOS were EDI systems at the time of the study.\textsuperscript{12}

Compared to the late 1998, more IOS options are available today. Still, this study is still relevant for today’s retailers and suppliers: IOS requires substantial financial and/or operational resource commitments for implementation and on-going production. How “fairly” IOS are evaluated still poses the same challenge.

4.4. Control variables

According to Chwelos et al. [16], the intent to adopt EDI depends basically on external pressure, perceived benefits, and IT readiness. Because the two variables (Strategic Goals and Goal Accomplishments) pertain to perceived benefits in our model, we considered six items as control variable candidates for the two IT variables (IOS use and IT Effectiveness): the number of EDI trading partners and annual sales for IT readiness, forced adoption, percentages of trading volume with the partner, and industry perception of IOS use for external pressures. These factors might negatively, or at least differently, affect the evaluation of IT effectiveness. Among them, however, only two items (number of EDI partners and forced adoption) were statistically significant control variables for retailers.

\textsuperscript{12}This does not mean that EDI was the only IOS; rather, that it was the only significant factor in the statistical models. In fact, some level of non-EDI IOS use was groupware (28%), shared database (25%) and extranet (16%), while EDI use was 56%.

Similarly, suppliers found only forced adoption a significant control factor for the model. Therefore, all the other control variables were dropped from the statistical models.

5. Results

The overall results of PLS path analyses are shown in Figs. 2 and 3.

5.1. Retailers

Strategic Goals had no impact on IOS Use. Thus, H1 was rejected. IOS Use positively impacted the level of Goal Accomplishments (path coefficient = 0.18, \( \alpha \leq 0.05 \)), thereby supporting H2. Nonetheless, IOS Use had little influence in the level of Goal Accomplishments as its \( R^2 \) was merely 0.03.

Significant factors for IOS Use, as measured by how many EDI transaction sets the retailer adopted with its supplier, are the number of EDI partners (path coefficient = 0.55, \( \alpha \leq 0.01 \)) and forced adoption (path coefficient = 0.17, \( \alpha \leq 0.05 \)).

Higher Goal Accomplishments resulted in more favorable IOS Effectiveness Evaluation (path coefficient = 0.25, \( \alpha \leq 0.01 \)), supporting H3. The importance of Strategic Goals positively impacted how favorable IOS Effectiveness Evaluation would be (path coefficient = 0.24, \( \alpha \leq 0.05 \)). Thus, the result affirms H4.

IOS Use has no direct bearing on how favorable or unfavorable IOS Effectiveness Evaluation would be in accomplishing strategic goals. This rejects H5.

5.2. Suppliers

Strategic Goals had no impact on IOS Use. Thus, H1 was rejected. IOS Use positively impacted the level of Goal Accomplishments (path coefficient = 0.18, \( \alpha \leq 0.05 \)), thereby supporting H2. Nonetheless, IOS Use had little influence in the level of Goal Accomplishments as its \( R^2 \) was merely 0.03.

Significant factors for IOS Use, as measured by how many EDI transaction sets the retailer adopted with its supplier, are the number of EDI partners (path coefficient = 0.55, \( \alpha \leq 0.01 \)) and forced adoption (path coefficient = 0.17, \( \alpha \leq 0.05 \)).

Higher Goal Accomplishments resulted in more favorable IOS Effectiveness Evaluation (path coefficient = 0.25, \( \alpha \leq 0.01 \)), supporting H3. The importance of Strategic Goals positively impacted how favorable IOS Effectiveness Evaluation would be (path coefficient = 0.24, \( \alpha \leq 0.05 \)). Thus, the result affirms H4.

IOS Use has no direct bearing on how favorable or unfavorable IOS Effectiveness Evaluation would be in accomplishing strategic goals. This rejects H5.
5.2. Suppliers

The importance of Strategic Goals had no impact on the level of IOS Use. Thus, H1 was rejected. Also, IOS Use had no impact on the level of Goal Accomplishments, not supporting H2.

The number of EDI partners of the retailer positively impacted the level of IOS Use as measured by the number of EDI transaction sets of the retailer adopted by its suppliers (path coefficient $= 0.61$, $p \leq 0.01$).

The greater the Goal Accomplishments, the more favorable IOS Effectiveness Evaluation (path coefficient $= 0.33$, $p \leq 0.01$). This affirms H3. The importance of Strategic Goals positively impacted how favorable IOS Effectiveness Evaluation would be in accomplishing strategic goals (path coefficient $= 0.45$, $p \leq 0.01$). This affirms H4.

H5 was rejected, as the level of IOS Use had no direct bearing on how favorable IOS Effectiveness Evaluation would be in accomplishing goals.

6. Implications

The research model tested three possible types of halo effects in evaluating IOS effectiveness: a halo from accomplishing strategic goals; a halo from having important strategic goals; and a halo from having IOS in place itself. The results were that the first two types of halo effects occurred for both retailers and suppliers. The presence of the third was not detected for either.

For retailers, path analysis showed only the second type of halo effect. They correctly evaluate IOS based on how much IOS contributed to strategic goal accomplishments. At the same time, IOS evaluation was influenced by the importance of the goals. When retailers have more important goals, their IOS evaluation was even more favorable. For less important goals, IOS contribution to goal accomplishments resulted in less favorable evaluations.

However, it should be noted that the $R^2$ of goal accomplishments is low (0.03) in the retailer path analysis model. While retailers recognize IOS helping achieve their strategic goals, they also know that there are many other factors (e.g., quality of business strategy, economic climate, and success in configuring a right marketing mix) which influence how much they achieve these goals. If so, the first type of halo effects may indeed exist, however subtly.

In contrast, the path analysis model for suppliers clearly shows the first two types of halo effect.
Suppliers give IOS credit as long as their strategic goals are achieved, although they do not see whether and how IOS contributes to goal accomplishment. This is due to the first type of halo effect; the joy of strategic-goals-met overshadows how they view the role of IOS. Moreover, the importance of strategic goals increases the amount of credit attributed to IOS, the second type of halo effect. Those two halo effects, in contrast, may “unfairly” discredit IOS contribution to business success.

Managers should be aware that they may be unknowingly giving IOS less share of credit or, even worse, making IOS a scapegoat, when their firms fail to materialize what they wanted to accomplish. Such might have be the case when ECR has fallen short of expectations and when channels had less than expected economic results.

Results seem to indicate that IOS adoptions are driven by the supplier side. Retailers adopt EDI systems based on (a) their IOS capability (e.g., number of EDI partners) and (b) forced adoption. The former factor, however, is three times as significant as the latter, as the path coefficients reflect (0.55 versus 0.17).

Interestingly, the study by Chwelos et al. showed roughly a 1:3:4 ratio among perceived benefits, IT readiness and external pressure for EDI adoption factors. This is similar to our study.

In contrast, suppliers adopted EDI systems based on their IOS capability, but forced adoption was not a factor. IOS are often based on vendor managed inventory where suppliers are in charge of product distribution tactics and are motivated to obtain detailed store-shelf information for planning their channel distribution tactics. In addition, ECR enabled suppliers conduct market research more effectively before and after new product introduction [32].

While retailers saw the direct positive effect of EDI systems on their strategic goal accomplishments however marginally, suppliers did not attribute IOS use to it. This is quite interesting because the results suggest that retailers are forced to adopt IOS and suppliers are the most motivated players to adopt IOS. Although both retailers and suppliers deal with multiple trading partners, suppliers probably regard IOS as the hub of their channel intelligence sources, whereas retailers see the benefits of IOS on the basis of individual trading relationships.

7. Limitations

This study is exploratory in nature because of convenience sampling, smaller sample sizes, limited supplier participation and IOS data prior to 2000. In addition, it had low response rates like those in other studies using unsolicited mail surveys. It should be noted, however, that F tests between the first and second half of the responses did not show significant non-response bias.

In this research, the evaluations of strategic goal importance and goal accomplishments used Likert scales to measure perceptions. They were not assessed using objective measurements, such as percentages of financial goals met. Those qualitative measurements, which allow for more subjective errors and biases, may add more to the halo effects. However, important evaluations of strategic goal accomplishment do require complex assessments and subtle judgment calls.

8. Conclusion

This exploratory research study showed that firms do not necessarily evaluate the effectiveness of IOS by how much IOS use contributed to achieving strategic goals. Rather, firms gave more favorable opinions on IOS, regardless of its contributions. This is due to the two types of halo effects where firms’ IOS evaluation is overshadowed by the extent to which their strategic goals are accomplished and the extent to which those strategic goals have significance to their trading partners. Moreover, suppliers seem to evaluate their IOS with a collective assessment of success. Retailers, on the other hand, tend to assess IOS effectiveness individually on how successfully a strategic goal is realized. Thus, while strategic goals and goal accomplishments both influence the evaluation of IOS effectiveness, suppliers and retailers evaluate the influence of IOS differently.

13 At the firm level, a powerful retailer such as Wal-Mart or Sears can enforce IOS adoption. Discussion here is based on our sample characteristics.

14 Nidumolu [45] reports that response rates for marketing channel studies tended to be below 20%.
Appendix A

Operationalization of constructs for IT adoption drivers and control variables.

<table>
<thead>
<tr>
<th>Scaling method</th>
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<tbody>
<tr>
<td><strong>IOS use items</strong></td>
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<tr>
<td>EDI transaction sets</td>
</tr>
<tr>
<td>EDI exchange frequency</td>
</tr>
<tr>
<td>Groupware</td>
</tr>
<tr>
<td>Extranet</td>
</tr>
<tr>
<td>Shared database</td>
</tr>
<tr>
<td><strong>Control variable I items</strong></td>
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<tr>
<td>EDI trading partners</td>
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<tr>
<td>Annual sales</td>
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<td>Transaction dependency</td>
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<td>Category sales dependency</td>
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<td>Industry IOS use</td>
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<tr>
<td><strong>Control variable II items</strong></td>
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<td>Forced adoption</td>
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</table>

References


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