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# Electronic data interchange: A perspective from Taiwan

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## ABSTRACT

*This study presents findings about perceptions and use of Electronic Data Interchange (EDI) in Taiwan. It was undertaken to help build a framework within which to better understand EDI in a global setting. Findings indicate that there are differences and similarities between perceptions and use of EDI in Taiwan and what we know about EDI use in Western cultures. Possible explanations are offered for these findings. Several research questions arise out of the findings that can guide future research about EDI in a variety of cultures, and sets of propositions for each research question are suggested.*

## INTRODUCTION

Electronic Data Interchange (EDI), one of the earliest forms and applications of electronic commerce, enables organizations to exchange data directly and thus redesign traditional processes around interorganizational transactions without paper. EDI uses electronically standard business documents to exchange data between trading partners' computers and enables firms to change the way they do business, thereby improving overall performance and enhancing competitive advantage (Emmelhainz, 1988; Mukhopadhyay, et al., 1995). The use of EDI is widespread and well documented not only in the United States, but also throughout Europe and Asia (Thissen and Stam, 1992; Neo, 1994; Jelassi and Fignon, 1994; Arunachalam, 1995). It has been widely used for several decades (Picot, 1993).

As the United States' (US) eight largest trading partner (Kaltenheuser, 2000) and a leading information technology manufacturer and exporter, Taiwan seems an appropriate subject

for EDI and technology study. Taiwan's manufacturers supply 49% of the world's notebooks, 58% of monitors and 64% of motherboards. Taiwan manufacturers also produce more than 70% of the world's graphics chips and 40% of the world's chipsets (Kovar, 2000). It has also been listed as one of the best places to do business. Additionally, the United States is Taiwan's largest export and import trading partner, across all industries, with over 40 billion U.S. dollars annually (Taiwan CetraNet, 2002). In addition to having a strong emphasis on technology manufacturing, Taiwan is also a heavy user of technology. It was one of six countries that developed a consortium to utilize EDI technology to handle export declarations (Jones, et al., 2000).

While some have argued EDI would disappear with the emergence of Internet electronic commerce technologies, Giga Information group (Wilson, 2000; Sliwa, 2000) reports that there is still room for growth for the traditional EDI implementation. Drickhamer (2003) suggests that traditional EDI provides a well-tested and proven platform that many companies depend upon. IDC, a technology research firm, suggests that traditional EDI commerce will have a compound annual growth rate of 8.4% through 2006 (Drickhamer, 2003). Even though Internet-supported EDI transactions are also expected to grow significantly, it does not appear to be the end of traditional VAN-mediated EDI systems. Before moving away from the traditional EDI system, managers will have to consider complexity and security issues. Scheier (2003) points out that companies that choose to move to Internet-based EDI must be willing to deal with the increased security issues, such as opening their internal systems to HTTP traffic.

However, many firms that have used traditional VAN-mediated proprietary EDI have begun to move away from that framework to use web-based EDI because it is less costly (Sliwa, 2000). Internet-based EDI is particularly appealing to smaller firms that may find traditional VANs cost prohibitive (Iacovou, et al., 1995). Yet, firms exploring the web as an alternative to EDI are continuing to use traditional EDI for doing business with established trading partners (Sliwa, 2000). Firms that have been using EDI for a number of years aren't sure if the Internet will replace EDI. Many believe they will use both EDI and the Internet as e-commerce tools. Although study of the newer Internet-based electronic commerce technologies is important, further study and understanding of traditional EDI is warranted, especially as it relates to international issues. This paper provides the results of a study that evaluates use of EDI in Taiwan, irrespective of EDI type.

## **BACKGROUND**

Research indicates that there are cultural differences in the perception, use of information technology (IT), and in the way information is managed and transferred (e.g., Newell, et al., 1998). Thus, cultural environment may have a large role in successful global management of information technologies including EDI. Furthermore, theory indicates that there are cultural differences in the management and conduct of business processes (Hofstede, 1983; Hofstede, 1985). Because the way information technology is perceived and used in an organization is embedded in culture (Tricker, 1988), and because of organizational and managerial differences across cultures, the way EDI impacts business processes may differ across cultures. Therefore,

EDI is likely perceived, implemented, and managed differently across cultures. While several have investigated EDI in the US and the success factors for implementation (Angeles, Corritore, Basu and Nath, 2001), an international study of EDI adoption not only offers insight into differences in usage between cultures, but also may provide new benefits or managerial insights that can be transferred across cultures. Maingot and Quon (2001) investigated EDI in the top public companies in Canada. This study attempts to empirically examine EDI in Taiwan in order to identify perceptions of issues to be key to successful EDI implementation and use in that country.

The Taiwanese government has provided incentives of preferential loans, tax shelters, and industrial parks to advance IT, and has worked to develop a national information infrastructure to effectively get the country on the information superhighway (McLeod, 1995; National Trade Data Bank, 1995). Furthermore, in 1990, Taiwan implemented a ten year *Industry Computerized Services Task Force Plan* and a ten year *Automation of Industry Plan* to provide guidance for and to encourage leading edge IT applications among firms such as EDI (Jones, et al., 2000). These plans are designed to foster the creation of a network environment in which firms can communicate and conduct business electronically, and to establish the necessary legal and communications infrastructure required for such an environment. As the government establishes the foundation for the electronic exchange of business information and transactions, private sector firms are encouraged to take the lead in the development of automation and B2B (business-to-business) e-commerce applications (Jones, et al., 2000).

The Taiwanese National Bureau of Standards established the Taipei EDIFACT Committee in November 1992 to oversee establishment of EDI standards for six specific segments of business (Ku, et al., 2000). The segments are *Port and Shipping*, *Trade/Customs*, *Financial*, *Manufacturer*, *Environment Protect*, and *Transportation*. Each group developed and launched its own EDI VAN, then transferred management and responsibility for the VAN to a newly established private sector company that is responsible for managing/overseeing EDI for its particular industry segment. For example, the Transportation Working Group and the Trade/Customs Working Group helped to form the Trade VAN Corporation that manages EDI for the transportation sector and the trading and customs sector. Since transfer to the private sector, the committees are working to integrate the VANs across sectors. Thus, part of the infrastructure and support mechanisms necessary for using EDI is in place.

We examine several aspects of EDI implementation that have been found to be critical to EDI (Jones and Beatty, 1998). These include perceived benefits, perceptions of trading partner pressure to adopt, and the extent of EDI integration. Although they have been demonstrated to be important, they have largely been assessed in the U.S. and Europe (e.g., Holland, et al., 1992). However, because there are cultural differences in the management and use of other types of IT, we believe that there may also be differences in these EDI related factors in a non-Western culture, such as in Taiwan.

One fundamental difference between Taiwan and many Western cultures is that Taiwan has a highly collectivist culture (Hofstede, 1983; 1985). In collectivist cultures, ties between

individuals are much tighter, and individuals are expected to look after the interests of the ingroup or collectivity into which they are born. The group's best interest takes precedence, and individual members support those interests (Hofstede, 1983; 1985). If the workgroup is not the same as the individual's ingroup, it will be made into one in order to be effective. A technology such as EDI that facilitates closer ties between trading partners may be received differently in a collectivist society than in an individualist society. For example, benefits may be perceived in terms of how they affect the group of trading partners rather than the individual firm. Benefits that affect entities outside the firm's boundaries such as improved customer service and improved trading partner relations may be perceived as more important than those that directly affect a single firm such as cost reduction, improved cash flow, improved inventory levels, and improved operational efficiency.

Trading partner pressure has a large role in EDI adoption in the U.S. because powerful trading partners are often able to coerce smaller partners to adopt (Kale, 1989; Reekers and Smithson, 1994). However, coerced firms often feel no need to find ways to further integrate EDI beyond what is required to satisfy the coercing partner, thereby limiting the extent of change EDI can facilitate. Many firms even continue to use manual intervention in their processes; rekeying data received from trading partners rather than completely automating the process as should be done for EDI to work efficiently (Nygaard-Andersen and Bjørn-Andersen, 1994). Thus, among western organizations, although EDI is widely used, evidence shows it is not widely integrated among trading partners, and critical mass is often not achieved.

However, the extent to which a firm integrates EDI into its external networks and internal operations is important. Indicators of EDI integration are number of trading partners with which business is done using EDI, number of transactions the firm processes with EDI, the number of different document types (e.g., purchase order, invoices, shipping notices) the firm uses EDI to process, and extent to which firms use manual intervention in EDI (Nygaard-Andersen and Bjørn-Andersen, 1994; Massetti and Zmud, 1996). The use of manual intervention in EDI includes rekeying data rather than allowing the EDI software to transmit it electronically. Firms often do this when they first adopt EDI because their organizational members are not yet comfortable with a paperless environment, or they do not fully understand the software (Nygaard-Andersen and Bjørn-Andersen, 1994). The percent of trading partners with which a firm does business using EDI is critical to successful usage. The larger the percentage, the greater the benefits a firm can realize (Bjørn-Andersen and Krccmar, 1995). Although the exact numbers differ among firms, and even industries, a critical mass of trading partners is necessary for a firm to realize significant EDI benefits (Bjørn-Andersen and Krccmar, 1995). In addition, the larger the number of functions within the firm for which EDI is used, the greater the benefits (Massetti and Zmud, 1996).

In a collectivist culture such as in Taiwan, if the workgroup is not the same as the individual's ingroup, it will be made into one in order to be effective. Thus, trading partners may be seen more readily as part of the group in Taiwan rather than as the means to an end or even as rivals in a effort to get the best deal (Kale, 1989). This may lead to greater cooperation in the external network (O'Callaghan, et al., 1992; Wrigley, et al., 1994). Furthermore, using EDI with

a critical mass of trading partners may lead a firm to use EDI for more transactions and document types in order to make doing business with EDI more cost effective and efficient internally.

## DATA COLLECTION

A survey questionnaire comprised of measurement scales that were validated in an earlier U. S. study (Jones and Beatty, 1997, 1998) was modified to include additional information and mailed to a random sample of Taiwanese firms across a variety of industry segments. These firms were identified through business customers listed on an EDI software and maintenance vendor list. The customer firms' names and addresses were verified through a variety of sources including a list of the Taiwanese Fortune 1000 firms and several on-line industry catalogs. A total of 322 questionnaires were mailed to the top IS manager listed in these resources and a total of 67 useable responses were returned for a response rate of 20.8%.

The survey methodology was used to gain a better understanding of EDI usage in a multitude of environments in Taiwan. Since EDI usage is well documented, it seemed appropriate to investigate the issues using this approach, as opposed to case studies. The two-page questionnaire consisted of questions related to reasons for adoption, benefits gained from adoption, satisfaction gained from use of EDI, problems related to adoption, and other questions related to future use of EDI technology. Sample questions included "Using EDI disrupted the workforce, at first" and "In general, using EDI has improved cash flow." Respondents were asked to respond to these and similar questions using a five-point Likert scale with choices ranging from "strongly agree" to "strongly disagree." Additional questions were asked to identify actual use of EDI; for example, respondents were asked to estimate the number of transactions per month handled via EDI and to estimate how many suppliers they interact with using EDI. Demographic questions such as EDI standards choice, industry sector, and reason for use of EDI and information technology completed the questionnaire.

## FINDINGS AND DISCUSSION

### *Profile of Firms*

The firms in this study range from small (100 or fewer full time employees) to large, with over 1000 full time employees (Table 1). Over 85% have 10 or fewer part-time employees, although 1 respondent indicated that his/her firm relied solely on 1000 part-time employees. Over one-half (51%) use information technology (IT) primarily to support basic operations, whereas another 30% use it to support corporate strategy (e.g., providing systems to make it easier for executives to gather information), and 19% use IT to drive corporate strategy (e.g., to redesign the way they do business).

A variety of industry segments is represented. Most were in service (46.8%), yet 14.9% were in transportation, 11.3% were in the retail/wholesale industry, and 9.7% were in manufacturing. The remaining 12.9% were in distribution, government, and education. The large percent-

age of service firms may be partially explained by the way in which EDI has been implemented in Taiwan. EDI implementation has been largely driven by the efforts of the subcommittees of the Taipei EDIFACT Committee, and each committee rolled out their VAN at a different time. Thus different industry segments began to use EDI at different points in time. The financial segment was first, then the trading, port and shipping sectors, followed by commerce and manufacturing. Thus, the earliest and most widespread usage of EDI in Taiwan is among the service sectors.

**Table 1. Size of Firms**

Number of Full Time Employees	% of Firms
<=100	29.7
>100, <=500	31.2
>500, <=1000	12.6
>1000	26.5
Number of Part Time Employees	
<=10	85.7
>10, <=50	7.9
>50*	6.4

\* One firm indicated that they had no full-time employees -- all were part-time.

### *Years of EDI Use*

Although EDI has been used for several decades, it is relatively new in Taiwan. One-half have had EDI in place less than 2 years, and only 14% have had it longer than 5 years (Table 2). Furthermore, 76% indicate that they still use manual intervention somewhere in the process. This is a sign that EDI use is still in its infancy. Over one-half (52%) of respondents were in firms that initiated EDI in their group of trading partners, and another 82% were personally involved in the decision to adopt. In the U.S. and Europe, large firms are often the initiators of EDI because they have the resources and power to take the risks and incur the costs associated with doing so (Reekers and Smithson, 1994; Iacovou, et al., 1995). However, because of the government initiatives that encourage EDI in Taiwan, an initiating partner is not necessarily large there. A Chi-square statistic was used to determine if there were differences among initiating firms with regard to size. The four categories of size based on number of full-time employees are shown in Table 1. No significant differences at the alpha = .05 level (Chi Square = 0.763, p = 0.858) were indicated. Thus, EDI initiators in Taiwan are not necessarily large firms, as they often are in the U.S. and Europe.

**Table 2. Years Firms Have Used EDI**

Years	% of Firms
<=1	36.0
>1, <=2	14.0
>2, <=3	14.0
>3, <=4	10.0
>4, <=5	8.0
>5, <=6	10.0
>6, <=7	4.0
>7, <=8	4.0

### *Type of EDI Used*

Eighty-two percent of respondents use traditional VAN mediated EDI, and 78% use some form of Internet-based EDI. However, 66% use both, which is consistent with what other research has found about use of Internet-based EDI. This is somewhat surprising, however, because the majority of firms in this study have had EDI in place no more than two years, and at the time they implemented EDI the Internet had been widely accepted as a tool for conducting business-to-business transactions. Furthermore, they are small firms, and thus seem more suited to Internet based EDI. Yet, their usage of traditional vs. Internet-based is consistent with that found in more established, larger users. One possible reason for the large use of traditional EDI is that even though the government is facilitating a national information infrastructure to effectively get the country on the information superhighway, and encouraging related IT initiatives through a ten year plan, these firms may not have been far enough along in their ten year plan at the time they began planning for EDI to have felt comfortable totally relying on Internet-based EDI. Another possible explanation is that because of their limited experience with EDI, these firms have turned to the more established Western model of EDI implementation that relies on a mixture of EDI types.

### *EDI Benefits*

Respondents indicated they achieve a variety of benefits from EDI, but when asked specifically whether their benefits are primarily internal, primarily strategic, or an equal mix of both, 44.8% said the latter. Another 39.7% said they were primarily strategic, and only 15.5% said they were primarily internal. Improvements in internal operations and external relationships place a firm in a better position to gain competitive advantage. However, these benefits may not



occur simultaneously, and research indicates that it may take some time before a firm is able to utilize EDI effectively enough to realize a mix of these benefits (Jones and Beatty, 1998). The large number of firms that have realized these benefits equally is somewhat surprising given that many of the firms in the sample have had EDI less than 2 years. One possible explanation is that because of the government incentives to establish EDI networks as well as other e-commerce initiatives, firms may have a better understanding of the strategic importance of the tool. Thus, they may have developed a broader view of the reasons for EDI; one that seeks to use EDI to position themselves more strategically while improving internal operations.

Respondents were also asked the extent to which their firms had achieved a set of specific benefits that have been demonstrated to be valid and reliable indicators of perceived EDI benefits (Jones and Beatty, 1998). Improved competitive position, improved trading partner relations, and better customer service were at the top of the list (Table 3). One possible explanation for this is that the collectivist culture in Taiwan places more value on the network of firms with which an individual firm does business. Another possible explanation is that the government emphasis on establishing EDI networks to improve business network effectiveness may focus adopting firms on using EDI to do just that; improve competitive position by improving their relationships with external constituents. Improved cash flow was the least realized benefit. One explanation for this is the relatively short time period many of these firms have had to recoup their expenses. Respondents indicated they find EDI useful for their firms and that they believe it is useful for their trading partners (Table 4). However, they were somewhat more lukewarm in their satisfaction with EDI in its present state, and indicated they plan to upgrade their EDI systems.

### *Extent of Integration*

These firms indicated they plan to expand the number of trading partners with which they do EDI, yet are not as positive that they will expand the number of functions for which their own firms use EDI (Table 4). Over 40% currently use EDI with 1% or fewer of their customers, and 48.8% indicated they do not use EDI with any of their suppliers, while 14% used for 1% or fewer of their suppliers (Table 5). Furthermore, 61.7% currently use EDI for 10% or fewer transactions per month, and 44.4% currently use EDI for only 1 document type. Finally, 38.3% used EDI for 1% or fewer of their total business transactions. Thus, there is currently fairly limited integration of EDI either within the firms or among the network of trading partners. Again, this may be partly explained by the relatively short time in which EDI has been operational in these firms.

**Table 3. Perceived Benefits**

<b>Benefit</b>	<b>mean (std dev) n=67</b>
Increased Ability to Compete	2.02 (.82)
Improved Trading Partner Relationships	2.04 (0.81)
Improved Customer Service	2.04 (0.73)
Improved Information Flow	2.16 (0.71)
Improved Internal Operations	2.28 (0.86)
Reduced Transaction Costs	2.34 (0.82)
Reduced Inventory Costs	2.60 (0.93)
Improved Cash Flow	2.74 (0.90)

\* All items measured on a 5-point scale where 1 = strongly agree; 5 = strongly disagree. Therefore, low scores indicate high realization of the benefit.

**Table 4. Planned Expansion/Usefulness of EDI**

<b>Benefit</b>	<b>mean (std dev) n=67</b>
EDI is useful for the firm	2.20 (.86)
EDI is useful for trading partners	2.43 (0.89)
Respondent is satisfied with EDI	2.66 (0.85)
Firm plans to upgrade EDI	2.54 (0.81)
Firm plans to expand number of trading partners with which it does EDI	2.43 (0.76)
Firm plans to expand the number of functions in the business that it uses EDI for	2.70 (0.97)

\* All items measured on a 5-point scale where 1 = strongly agree; 5 = strongly disagree. Therefore, low scores indicate high realization of the benefit.

Research indicates a similar phenomenon in Western firms that integrate to please a powerful trading partner, but have limited internal integration. Thus, another possible explanation for the limited internal integration is that these firms in Taiwan implemented EDI to take advantage of opportunities provided by the government to upgrade their systems, and are more willing to take visible steps to use it more widely (e.g., more trading partners) but are not as willing to integrate it deeply into their internal operations. Another possible explanation is that firms do not have the technology infrastructure to integrate EDI beyond a few functions.

## SUMMARY

Findings indicate that relatively small firms in Taiwan are initiating EDI, and that these firms are using a mix of traditional VAN-mediated and Internet-based EDI. Thus, it appears that there are both similarities and differences in EDI in Taiwan and what research tells us about EDI in the West. For example, large firms typically initiate EDI in Western cultures such as in the U.S. and Europe. However, the firms in Taiwan seem to have followed the Western model of using both traditional and Internet-based EDI.

Findings also indicate that although EDI usage is relatively new in Taiwan, it is being used to strategic advantage. Firms report that they are achieving both internal productivity improvements as well as competitive benefits. In addition, they report that they are able to use EDI to improve trading partner relationships. Thus, unlike in many western cultures where firms often feel coerced to implement EDI to appease large trading partners, Taiwanese firms seem to be using the tool to improve their relationships with trading partners. Furthermore, it does not appear that it is necessarily large firms the initiate the move to EDI. This may be partly because of the government incentives to implement.

Unfortunately, firms report that they have not greatly improved internal productivity such as improved cash flow or reduced inventory costs. However, this may largely be due to the fact that most of these firms had only implemented EDI less than 2 years earlier. Their overall satisfaction with EDI is somewhat lukewarm, and they are planning to upgrade. This may reflect an initial learning curve in which they are investigating the technology and what it can do for them. In spite of this, they believe that it is useful both to themselves and to their trading partners.

These firms do not appear to have integrated EDI extensively into their businesses or trading partner networks. This is not surprising, given the short amount of time they have been using EDI. However, while they indicate that they plan to expand the number of trading partners with whom they use EDI, they are more conservative in their plans to expand the number of functions within their own business for which they use it. Thus, they want to use it with more trading partners, but not for more transaction or document types.

Because EDI is relatively new to these respondents, they may either have not had sufficient time to realize internal benefits or to integrate it more deeply into their firms. Another possibility is that they are still implementing a technical infrastructure that will better support EDI usage

**Table 5. Integration of EDI within a Firm**

Type of Integration	% of Firms
<b>% of Customers EDI is used with</b>	
<=1%	40.4
>1%, <=10%	25.6
>10%, <=50%	17.0
>50%	17.0*
<b>% of Suppliers EDI is used with</b>	
0	48.8
>0, <=1%	14.0
>1%, <=10%	16.3
>10%, <=50%	6.9
>50%	14.0**
<b>% of Transactions per Month EDI is used for</b>	
<= 1%	25.5
>1%, <=10%	36.2
>10%, <=50%	19.2
>50%	19.1
<b>Number of Different Document Types EDI is used for</b>	
1	44.4
2	8.9
3	8.9
4	8.9
5	6.7
6	4.4
7	4.4
>=8	13.1
<b>% of firm's total business transactions done using EDI</b>	
<=1%	38.3
>1%, <=10%	14.0
>10%, <=50%	12.8
>50%	14.9***

\* 2 firms report using EDI for all their customers

\*\* 1 firm reports using EDI for all its suppliers

\*\*\* no firm reports doing 100% of its business transactions using EDI, but 1 firm does 90%

However, they are making efforts to garner a critical mass of trading partners with which to use EDI. Perhaps this is motivated by the collectivist culture in Taiwan that highly values the network of firms with which an individual firm does business. Another possible explanation for this is that the government initiatives that have encouraged these initial adopters of EDI are also motivating the firms with which they do business to adopt as well. Regardless of the explanation, EDI is still in its infancy in these firms, yet they seem to be taking steps to realize its benefits and are seeking to upgrade their EDI systems to make it use even more efficient.

## IMPLICATIONS FOR FUTURE RESEARCH

These findings indicate that EDI in Taiwan differs somewhat from the profile of Western usage that research has provided; yet usage may be rooted in the Western model. Some research questions arise out of these findings that future research should explore to better understand global EDI usage. One research question is the extent to which differences in EDI usage between cultures is culturally based and the extent to which it is technology based. For example, research could explore propositions about how much the decisions about type of EDI used and integration of EDI within a firm are based on technical infrastructure and IT maturity. Another set of propositions could examine the extent to which cultural factors impact EDI choices, not just in Taiwan, but in other parts of the world and other cultures.

Another research question arises out of the fact that these findings are based on measures developed and validated in a Western culture. The research question is what are other relevant EDI related factors not captured by a Western model. For example, one set of propositions could examine the role of cultural values and beliefs on trading partner relationships and how that impacts the way EDI is used between trading partners. One finding indicated that firms tended to include customers more than suppliers in the EDI network. Thus, another set of propositions could examine whether suppliers and customers are viewed differently from a power structure perspective (see Hofstede, 1983; 1985) so that firms tend to initiate relationships downstream rather than upstream.

A third research question addresses the implications for global trade using EDI. One set of propositions could examine whether and/or how cultural differences impact the exchange of business-to-business transactions using EDI between organizations that operate in different cultures. Another set of propositions could examine the impact of these differences in the exchange of business transactions among divisions of large multinational or global firms.

Finally, additional longitudinal research should be conducted to investigate the evolution of EDI adoption in Taiwan. This research agenda would also provide an opportunity to study the relationship between VAN-based EDI and Internet-based EDI. Further study should be conducted to address the factors that lead organizations to move from VAN-based EDI to Internet-based EDI.

## CONTRIBUTIONS

This study has contributed to the understanding of EDI by providing an assessment of how various factors that are important in EDI usage in the Western culture are perceived in another culture. This helps build a framework within which to assess EDI from the perspective of firms in cultures other than those found in the U.S. and Europe. This is important because much of business today is global, and it is a mistake to assume that a given technology such as EDI is perceived and used the same way around the world. Knowing some of the differences and similarities can help build better business relationships. However, research is an ongoing process, and any given study is just one step in our efforts to gain knowledge about a particular phenomenon. Thus, this study also makes a contribution by providing three broad research questions that arise out of the findings, and suggesting sets of propositions that future research might address to further strengthen our understanding of EDI in a global setting.

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