Readiness of Small Enterprises for GIS: The Question of Strategy

James B. Pick  
*University of Redlands, james_pick@redlands.edu*

Kamala Gollakota  
*University of Redlands, kamala@redlands.edu*

Hamid Falatoon  
*University of Redlands, james_pick@redlands.edu*

Richard Greene  
*Northern Illinois University, rgreene@niu.edu*

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University of Redlands
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Richard Greene
Northern Illinois University
rgreene@niu.edu

ABSTRACT
Small enterprises are beginning to utilize Geographic Information Systems (GISs) and spatial technologies. Since these technologies have only recently become widely available for small enterprises, there are challenges including costs, training, skilled workforce, data gathering and management, and competitive strategy. Two conceptual theories of GIS strategy are discussed with respect to small enterprises.

The goal of the present exploratory paper is to analyze readiness for undertaking spatial technologies, with a focus on GIS strategy and competitiveness. The research questions are analyzed through in-depth case study analysis of two small enterprises in southern California and results are interpreted based on the conceptual theories. The findings show that alignment theory is useful in assessing the potential for GIS. The evolutionary framework for strategic GIS is supported in two of the theory’s three dimensions. The paper offers recommendations on differences for small enterprises, versus medium and large ones in readiness and GIS strategy.

Keywords
Small enterprise, GIS, strategy, readiness, skilled workforce

INTRODUCTION
GIS and spatial technologies are increasingly used by businesses and nonprofit enterprises. The size of the GIS marketplace in 2005 was estimated in the range of $20 billion, with an additional $40 billion in government spatial data collection (Longley et al., 2005). Although GIS was originally applied largely to governmental organizations, it has grown rapidly in businesses in the past 10 years. With the advent of widespread consumer spatial mapping through Google Earth, Microsoft Virtual Earth and other services in 2005, the potential of the technologies for small business has dramatically increased. At the same time, the lack of training and knowledge of the technologies constrains adoption and may lead to uses that are based on marginal data or faulty assumptions.

This study has the goals to gain understanding of the readiness of small enterprises to undertake substantive uses of GIS and spatial technologies and to determine what small enterprises see as the strategic benefits in using the technologies. Most of what is known about GIS readiness and strategy in businesses and other enterprises comes from the literature on GIS in medium and large sized businesses (Grimshaw, 2000; Longley et al., 2005; Pick, 2008), although there are some studies of small business (Neufeld and Griffith, 2005). The paper is divided into the following sections: a literature review covering business GIS, IT in small business, and theories of GIS strategy; the research questions; methodology; case study findings for two small organizations; discussion; and conclusions.

LITERATURE REVIEW
GIS in businesses has been studied for many years, but there has been relatively little in-depth study. Neufeld and Griffith (2005) examined the GIS development choices facing a Isobord, a Canadian manufacturer of particleboard. The firm collected the raw material straw from farmers in agricultural areas and needed to employ spatial technologies to achieve transport for more efficient collection. A successful GIS prototype had been designed and built by Isobord’s sole employee in the agricultural region. For full implementation, Isobord’s options included going with a tiny consulting firm, utilizing a moderately priced desktop GIS provider, or going with a very expensive consulting firm that included a lot of data, GPS,
and sophisticated data-bases. Although the case is left unresolved, it brings up key issues relevant to the present study of training, cost, link to strategy, and ability to manage the technology.

The case study of Engineering Systems (ES), a 15-person GIS consulting firm serving county and city governments, focused on systems development, training, and staff retention (Pick, 2008). The firm’s emphasis is to offer high-precision GIS to local and regional governments for such uses as land use, cadastral applications i.e. for tax collection, sanitary, transportation, and zoning. The firm supported several GIS vendors and could provide routines that would very accurately convert spatial data-sets between vendor standards. The firm took on multi-year projects that often involved placing several employees on-site at larger firms to support GIS implementation. ES provided in-house training and development to produce skilled employees that rivaled larger competitors. However, a major problem that occurred was the hiring by ES’s larger client firms of its skilled on-site employees. This would often set ES back by a year or two due to loss of contracts and its personnel. This case study accentuates the issue of GIS training and retention of skilled workforce in a small enterprise.

For larger businesses having GIS, it is most often an independent unit, the GIS department or office, that is responsible for implementing spatial technologies company-wide (Grimshaw, 2000). Key aspects of success for this commonplace arrangement are staffing, training, and the relationship of the GIS department to the IT department (Pick, 2008). GIS provides the spatial expertise, while IT provides data-base, networking, programming, and infrastructure expertise. The two departments need to work together well, communicate frequently, and keep their short-term and long-term planning synchronized. If this relationship breaks down, such as happened in a case study of the insurance firm Norwich Union (Pick, 2008), GIS can weaken or fail.

Another issue for large enterprises is to gain the support of top management for investing in GIS over a long period. In some of the most successful large-firm GIS implementations such as Rand McNally and Sears, top management provided a long-term commitment to spatial technologies, which overcame the issues of employee training, data gathering and management, software updating, integration of GIS with other systems, and developing user interest, knowledge, and motivation (Pick, 2008).

The literature on IS use in small businesses has supported that there are often not the necessary internal workforce, investment in IT, and management support for successful outcomes (DeLone, 1988; Yap, Soh, and Raman, 1992). The latter study emphasized the IT tended to be more successful in small business if there were knowledge and experiences in IT, investment in it, strength of consultants and vendors, and participation of users. Chau (1995) showed that small enterprises tended to use packaged software, rather than developing in-house applications. Small business owners tended to put heavier emphasis on package selection and examine technical factors more than small business managers. Overall, for small businesses, there was more success with outside consulting and packaged solutions rather than maintaining skilled IT workers and development internally.

This paper also considers how well IT and GIS strategic frameworks can be applied to small enterprises. The two frameworks considered in this paper are: IT alignment theory (Henderson and Venkatraman, 1996; Papp, 2001), which was expanded into GIS alignment theory (Pick, 2008), and the evolutionary framework for strategic GIS (Pick, 2008). IT strategic alignment model (Henderson and Venkatraman, 1996) considers strategy in four quadrants, business strategy, IT strategy, organizational infrastructure, and IT infrastructure. The quadrants’ relationships imply the extent to which business and IT strategies and infrastructure operate in synergy. If alignment is closer between quadrants, then there is greater synergy in strategy. This alignment theory was extended to take into account GIS (see Figure 1).
This framework implies that more time and effort would be needed to manage, coordinate, and control GIS and IT in a firm versus only IT. Here there are six cells that have need for integration, versus four cells with IT alone. This is especially true if GIS and IT are loosely coupled, which occurs in larger firms in which the functions are organizationally separate. It implies for a small firm that a key question is whether GIS and IT will be consolidated with the same consultant or vendor, or will be in different locations organizationally and functionally.

The second strategic framework is the evolutionary theory for strategic GIS (Pick, 2007). This theory classifies GIS for a business based on 3 dimensions: (1) extent that spatial applications are customer-facing, (2) extent that geography is part of the enterprise, and (3) extent that the enterprise utilizes a spatially-enabled enterprise-wide integration platform (Pick, 2007). Findings have shown that GIS strategy is more important to the firm, versus other types of strategies, if (2) is larger or (3) is larger. However, (1), the extent spatial applications are customer-facing, has no influence on how important GIS strategy is to the firm (Pick, 2007). This framework was tested and validated on 20 firms that were predominantly medium and large sized. The present paper will also examine this framework relative to the two GIS cases.

RESEARCH QUESTIONS

The research questions are the following:
1. What is the state of readiness of small enterprises in developing and implementing GIS applications?
   This question considers whether small businesses ready to proceed with GIS versus they are confronted by barriers to proceeding with it.
2. What strategic frameworks are relevant to small enterprises in developing, implementing, and succeeding with GIS applications?
   This question considers particularly the relevance for small enterprises of the Business-GIS-IT alignment theory and the Evolutionary Framework for Strategic GIS.

METHODOLOGY

The methodology for this research is case study (Yin 1994). The case study strategy consists of definition of the study focus, framework construction, interviews, data collection, and case analysis. Case studies are often used to deepen insight into enterprises and their decision-making processes, sometimes more so than can be done with large sample surveys (Yin 1994). Case study investigation often has small sample sizes (Yin 1994).

The two enterprises for this exploratory study were selected from a set of five firms in a large-scale study funded by the U.S. Small Business Administration of GIS in small business. The enterprises were chosen on a convenience basis, but from different industries (home accessories and land appraisal), which are related to each other. Although random or other sample survey methodology would yield a larger and more representative sample, the approach is beyond the scope of this
research. For future research, such an approach would have the challenges of high rates of non-response and for respondents a likely very small percent that use GIS as well as secrecy constraints prevalent with spatial applications. The two enterprises had common high motivation to explore the potential of GIS applications, had been in business of at least 15 years, and had in the range of 5 to 15 employees. The other three firms available in the study sample did not meet these criteria. For each firm, the protocol is to interview the firms’ owners and top manager. They were chosen because they are responsible for spatial technologies. The interviews utilized a standard interview protocol and set of general questions. They were transcribed in writing and tape recorded. The interview transcripts were sent to the interviewees for factual corrections. Secondary materials on spatial technologies in the firms were requested, and provided by most firms. They consisted of company reports, postings, and writeups. In addition, secondary business materials were obtained from company websites and standard business information services.

CASE STUDY RESULTS

The case study results for ABC Blinds, Shutters, and Draperies and for Jacobs Appraisal and Associates are based on the interviews and other documents provided by the organizations. For both firms, GIS prototype applications have been implemented, but full-scale operational use has not yet occurred.

ABC BLINDS, SHUTTERS, AND DRAPERIES

ABC Blinds, Draperies and Shutters (ABC Blinds for short), is owned by a husband and wife team: John and Sally Smith (fictitious names). John has been in the drapery business for over 30 years, first helping with his father’s drapery dry cleaning business, and later working for various other drapery and window covering firms. When John first met Sally, she was working as a waitress and a real estate agent. At this time John was running the wholesale division of Blind Design. In 1991, Sally received training on draperies and blinds from John’s company and went on to become a dealer for that firm. By 1992, Sally’s business took off and John quit his job and joined her in the business. Initially, they ran their business out of their house, and later moved to a small 1,500 sq ft facility. Shortly thereafter, they moved to a larger 2,500 sq foot facility with manufacturing facilities and a showroom in the basement, and offices upstairs. They incorporated their company in 1997. By 2007, ABC Blinds, had over a million dollars in sales with five full time employees and three part time employees. The company operated out of its own facility in Victorville. This facility served as both a showroom and office. The firm was dependent from week-to-week on its marketing and sales in its key markets that have had growing numbers of competitors.

Products and Services

ABC Blinds sells a wide range of standard and custom window coverings. Products included: wood blinds, faux wood blinds, aluminum blinds, Roman shades, roller shades, cellular shades, and various draperies. Geographically, ABC Blinds markets and installs products primarily in San Bernardino County, especially within an hour driving distance from their office. This county had a population in 2006 of almost two million people and grew 17.0 % between 2000 and 2006 (the population growth in California during that period was 7.6%, and US was 6.4%)(U.S. Bureau of the Census, 2007).

By 2007, ABC Blinds had a database of over 9,000 customers. The company targets higher income customers, typically those with incomes greater than $80,000 per year. Since the company is involved with the customer from the stage of planning through installation, they charge higher prices than standard non-custom blinds cost. Lower income customers who need blinds often purchase standard blinds at big-box, chain stores like Home Depot or Lowe’s. ABC Blinds estimated that 50% of their business came from referrals or repeat customers.

GIS mapping and analysis were accomplished in consultation with the users at ABC Blinds. The study team focused part of its interviews on determining what internal and external attributes might be the most relevant and useful to be mapped. The team also directed question sets toward determining the data and process flows in the present information systems (ISs), and assessing the technology skill levels of the firm and its outside IT consultant.

This GIS project consisted of taking the customer list from ABC Blinds, re-formatting and data-cleaning it, geocoding it based on parsed addresses, combining the customer list with a cleaned and re-formatted sales spreadsheet, and producing a set of maps including customers, sales totals, customers by time period, and customers by major product category. The 8,000 customer records from the past twelve years were submitted to geocoding. Those that successfully geocoded were mapped. Additional customer-record attributes, including year of sale, sales amount, number of sales, etc., were compiled by ABC Blinds from data on sales and marketing in the GoldMine software. The maps have been used by ABC Blinds management in understanding the spatial distribution and characteristics of past customers relative to competitor locations throughout its large region and in refining its marketing strategies. The firm in early 2008 was beset by two crises,
the sharply declining real estate sales and price levels reducing its sales and sales of half of its ownership with one owner departing. These factors have slowed it from purchasing commercial GIS web services, but that is anticipated in late 2008.

Mapping Demographic, Economic, and Business Characteristics

The second major area of mapping utilized Business Analyst Online, a spatial web service from ESRI Inc. that provides demographic, economic, and business information for the U.S. by all levels of census geographical units, by addresses, and for rings, donuts, and hand-drawn polygons (ESRI, 2007). There are over a thousand attributes available at various geographical levels. This section discusses prototypes of BAO mapping and spatial analysis applied to ABC Blinds.

In the interviews, ABC Blinds management pointed to the High Desert area’s population growth as important in several respects – it brings in more potential customers, attracts more competition, and impacts housing development. Besides sheer growth totals, the geographic distribution of present and future population density is useful. BAO has maps of demographic projection attributes available, which stems from ESRI’s strength in population forecasting.

A second prototype of use of Business Analyst Online for ABC Blinds is the projected shift in housing values from 2006 to 2011 in ABC’s key market areas. The median value of owner-occupied homes in California grew from $211,500 in 2000 to $477,700 in 2005, at a rate 2000-2005 of 16.3 percent yearly. The rate of increase was exceeded by several percentage points in the largest cities of Victorville, Apple Valley, and Rancho Cucamonga. For the Victorville and Apple Valley, the resultant prices were about half that of the state, while an extrapolation for Adelanto and Barstow, assuming similar appreciation over the five years, would be about 37 percent of the state median value in 2011. Hence even with rapid price rises, these cities prices remained attractive. The flip side is that expenditures on home accessories would also lies considerably under the statewide median.

In the study of ABC Blinds, Geodemographics was applied through Community Tapestry, an ESRI product that is included with the full version of Business Analyst Online (ESRI, 2006, 2007). It consists of 65 segmentation categories (ESRI, 2006) that are grouped into 12 LifeMode groups (see Table 1). The LifeMode group that was found to be most significant
in characterizing the market areas of ABC Blinds was “Global Roots,” which is characterized as “Ethnic and culturally diverse families. Households are young, have low to moderate incomes, and often rent in multiunit buildings…Maintain ties with home countries, sometimes by travel.” (ESRI, 2004). Within the Global Roots LifeMode are eight segmentation categories. Three of them, International Marketplace, Industrious Urban Fringe, and Urban Melting Pot, were important for ABC Blinds market areas and are characterized in Table 1. The household types are linked to ABC Blinds products, since households with low income prefer inexpensive blinds, while higher income ones have greater preference for costlier draperies and shutter. The detailed spatial analysis of these product categories by ABC’s small geographic market areas was conducted but cannot be included in this paper due to space limitations.

<table>
<thead>
<tr>
<th>Household type</th>
<th>Industrious Urban Fringe</th>
<th>Inner City Tenants</th>
<th>City Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family mix</td>
<td>Mixed</td>
<td>Mixed</td>
<td>Mixed</td>
</tr>
<tr>
<td>Median age</td>
<td>28.6</td>
<td>27.8</td>
<td>28.7</td>
</tr>
<tr>
<td>Income</td>
<td>Middle</td>
<td>Lower Middle</td>
<td>Lower Middle</td>
</tr>
<tr>
<td>Employment</td>
<td>Skilled/Services</td>
<td>Services/Prof/Mgmt/Skilled</td>
<td>Skilled/Services</td>
</tr>
<tr>
<td>Education</td>
<td>No HS diploma; HS Grad</td>
<td>No HS Diploma; HS; Some College</td>
<td>No HS Diploma; HS Grad</td>
</tr>
<tr>
<td>Residential</td>
<td>Single family</td>
<td>Multiunit Rental</td>
<td>Multiunit Rental</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>White, Hispanic</td>
<td>White, Black, Hispanic</td>
<td>White; Black; Hispanic</td>
</tr>
<tr>
<td>Activity 1</td>
<td>Attend movies once a week or more</td>
<td>Buy baby products</td>
<td>Shop at convenience stores</td>
</tr>
<tr>
<td>Financial</td>
<td>Have mortgage insurance</td>
<td>Have personal education loan</td>
<td>Have personal education loan</td>
</tr>
<tr>
<td>Activity 2</td>
<td>Drink coffee often</td>
<td>Buy/rent horror, comedy videos</td>
<td>Own a cat</td>
</tr>
<tr>
<td>Media</td>
<td>Listen to Hispanic/variety radio</td>
<td>Watch syndicated and cable TV</td>
<td>Watch daytime TV</td>
</tr>
<tr>
<td>Vehicle</td>
<td>Own/lease Toyota</td>
<td>Belong to car dealer auto club</td>
<td>Own/Lease Ford</td>
</tr>
</tbody>
</table>

Source: ESRI, 2004

Table 1. Characteristics of Three Segmentation Categories within LifeMode Group of Global Roots

Geodemographics constitutes for small businesses a new and affordable spatial technique that can be combined with a firm’s customer information as well as with census data to gain insight on differences in the dominant profiles of market areas. At the same time, the business user must be aware that smaller “outliers” with market potential may be overlooked by the method. For ABC Blinds, analysis of its current key market cities has already provided insights. Among the advantages of having the capability in house are: (1) new or underserved market areas can be assessed through Geodemographic evaluation, (2) current high-potential LifeMode groups and specific segments can be monitored longitudinally to scan for promising categories, (3) older market areas can be evaluated for continuing promise, re-location of facilities and personnel, or possible closure, and (4) advertising and marketing.

Routing applications

ABC Blinds has workers in the field on a daily basis who could benefit from routing software. They include two sales representatives who visit four to eight prospects and customers daily for initial sales meetings, design consultation, and costing assessments. A full-time and part-time installer travel daily to customer sites to install blinds and other products, and to maintain products. The field workers tend to be long-time employees with experience and knowledge of locations and routing. However, since there has been rapid urban growth as well as traffic buildup in the region in ABC’s market areas, it is sometimes difficult for them to accomplish optimal routing.

The field marketing and installation people at ABC Blinds can conveniently use the Rand McNally routing map service as needed to refine and make more efficient their “gut” routing experience or to chart routes to new, unfamiliar areas. ABC Blinds has the opportunity to benefit from spatial applications in marketing and sales, as well as in routing. The feasibility has been successfully tested with the recommended mapping services (Business Analyst Online and Rand McNally Road Explorers Premier). The applications have been favorably evaluated by ABC blinds management, who have found them to be useful in mapping of customers, key economic, business, and demographic attributes, geodemographic patterns, and drive-times. The field staff at ABC Blinds made some use of this recommended mapping service, although it has changed its field staff recently due to one owner departing.
JACOBS APPRAISAL AND ASSOCIATES

The second case study is of Jacobs Appraisal and Associates, an associated group of 10 land appraisers located in southern California. The founder, Sam Jacobs (fictitious name) started the limited partnership in 1991. Sam has served as the mentor of the other associates during this period, training them and readying them to take various levels of state licensing exams, which the group has moved up well with. Although initially the group focused on appraisals in the Mohave Desert and its water resources, the group has specialties in vacant land, multiple family, commercial, industrial, church, eminent domain, hotels and motels. The group also provides lease-market studies, cost-benefit, litigation and expert witness support. The group has capability to provide appraisals all over southern California, and occasionally in northern California and Arizona. The group indicates that industry demand and profitability are driven by data. There is fluctuation in ownership from various drivers that continuously alter the industry, with the recent spate of foreclosures as one example of a driver.

The group competes with other licensed appraisers, often on an approved list for a certain locality. There is some “competition” with an automated systems known as the automatic valuation model (AVM), which applies cruder methods to appraise large developments, but that has come into criticism in the current downtown.

The essential success factor cited by the group for appraisers is data, particularly its accuracy and presentation. One mentioned, “The better you report, the more concisely, and more accurately, the more the client gets for his/her dollars.” A standard in California for appraisers is that the gathering of data needs to be replicable from the data source. This has implications for GIS, since a strong and accurate spatial data base would lead to a replicable data that couldn’t be challenged.

The group pointed to challenges in the pre-GIS environment that point towards GIS and GPS use. The problems cited for raw land are: lack of computerized data, inconsistent standards for data retrieval, and lack of integration of data. All this leads to lower productivity. For appraisal of commercial and industrial properties, the problems are: lack of zoning information, inconsistent hardcopy map scales, lack of cooperation and occasionally untruthfulness by government and private data services in providing data, confusion by dividing and combining of properties, and lack of government support staff.

Before GIS, the Jacobs appraisal group made use of an inconsistent set of hardcopy and web-delivered maps from multiple agencies and sources, including land parcel maps, US Geological Survey topographical maps (“topos”), hazard maps, maps of wells, and earthquake and hydrology maps. For open land use, the maps have property markets, but they are often difficult to locate, especially without GPS equipment. With multiple suppliers, there are issues on accuracy of the sources and the efficiencies in gathering data.

Pre-GIS Jacobs Appraisal had limited IT capability with several desktop and laptop computers, while half of the workforce had GPS units. An on-call IT consultant provided maintenance.

The strategic vision for Jacobs Appraisal emphasized the need for shared data. This would lead to better quality, efficiency, and speed of work. Since the individual appraisers would share this experience, they could support each other to a greater extent in data management. They also sought a way to perform part of their appraisal analyses in the office, rather than doing it in the field. They pointed to GIS as a solution to the integrated data vision, but one they felt would require considerable training.

In implementing GIS and spatial technology uses at Jacobs Appraisal, the group consulted with ESRI, a major vendor firm and with SBA-grant experts. The following GIS solution is in process of implementation. A spatial data-base known as a geo-database (ESRI, 2008) has been implemented. This data-base contains geographical layers for land use, land parcels, USGS topos, hydrology, hazards, zoning, roads, and city and county boundaries. These layers contain rich data-bases of attribute information, for instance for land parcels, dozens of assessor characteristics are available. The group is being trained to perform spatial analysis of the geographical and attribute information in order to conduct their appraisal and consulting tasks.

A further aspect of the design is that appraisal coordinates marked in the field can be loaded into the geodatabase as a new layer. In the office, appraisers can identify key land coordinates for field work and load the coordinates into their GPS devices. This gives the advantage of being able to precisely locate key points used during particular appraisal field visits. For instance, in a test of this capability at a remote desert parcel being appraised, having the exact GPS location of a key boundary point for a property led to a 350 foot greater accuracy than prior to GPS.
Overall, Jacobs Appraisal has available a robust and accurate, 8-layer geo-database for Riverside and San Bernardino Counties, training in how to utilize it with basic GIS analysis, and the capability to both GPS-record points in the field to add to the GIS, or export key coordinate points for fieldwork projects. The Group feels that this approach is a huge advance for land appraisers, who on the whole have had very little success with GIS up to this point. Some appraisers have recently begun to use the capability provided.

**DISCUSSION**

The two small enterprises are seen to have succeeded over many years without GIS and spatial technologies. Yet they are both confronting mid to long-term issues that involve geography. In the case of ABC Blinds, the firm depends on its growth and continuing development of its customer base, which is spread over a vast land area, probably an area that is too large for such a small 8 to 10 person firm. This is especially true give the presence of around 50 competitors in ABC’s market area. ABC can improve its competitiveness by gaining a better understanding of where its customers are located, what their product preferences have been, what the size of annual sales are, and what the geodemographic characteristics are for its key markets. This knowledge might influence ABC Blinds to reduce its market size, focus on particularly promising markets, or scale up its size for other markets. Although ABC has only one location currently, this spatial knowledge of historical, current, and prospective customers, helps it in the decisions of staying in only one location or locate satellite offices in key areas, a strategy that has not been successful in the past.

For Jacobs Appraisal and Associates, geography is inherently important, since its core business is tied to the land, its dimensions, value, and characteristics. Greater depth of knowledge and rapid access to information on the land areas and characteristics can make the group more productive, efficient, and accurate. The combination of GIS for a rich spatial database and GPS for pinpoint accuracy in the field keyed to the GIS can increase its competitiveness. It would enlarge potential products and services for Jacobs, including the ability to undertake more complex projects, to extend more easily to areas outside of its two core counties, and even the potential to market its new-found GIS-GPS capability.

What differs from medium and large-sized businesses in the two cases is the reduced potential to support GIS and spatial applications internally, leading to need for dependency with external parties, such as a GIS consultant, GIS vendor, outsourcing, or expensive web service. Essentially similar choices were present in the dilemmas in the Isobord case (Neufeld and Griffith, 2005). Another difference from larger businesses is the risks in training and retention of employees. For instance, at ABC Blinds, perhaps two or three employees would be cross-trained to operate GIS. They are not the owners who are too busy to spend time on GIS. Hence, there is risk of losing the key personnel through attrition or hiring away. Jacobs Appraisal would seem to have more potential to retain its trained workforce, since up to 7 or 8 of employees will be trained in GIS. However, since the firm might have greater dependence on GIS, the risk may be equivalent.

Regarding the strategic theories, the Business-IT-GIS-alignment theory appears relevant in the case studies. In both instances, the enterprises indicated important short-term and mid-term business strategies, some of which were aligned with GIS. For instance, Jacobs Appraisal indicated that its long-term vision called for expanded accuracy and depth of data. The data had to be spatial given the inherent connection to the land. Hence the business strategy is closely aligned with developing GIS and GPS. For ABC Blinds, the mid-term strategy is to compete effectively against growing numbers and types of competitors in its vast market region. Although perhaps less obvious to the firm, again GIS is aligned to this business goal through enhanced knowledge of the proximities and spatial arrangements of markets, customers, and competitors. The alignment theory also raises the question of how IT is aligned. For ABC Blinds, that could potentially be a problem, since the firm depends largely for technical support on an outside IT consultant. There is the potential to divide the IT and GIS functions, which would lead to more complex management, as pointed out earlier. For the appraiser group, this is less likely to happen because the same consultant will support both IT and GIS.

The Evolutionary Framework for Strategic GIS (Pick, 2007) is closely related to the case study findings. One of the dimensions is importance of GIS in the business, and we have seen this is supported by both cases. The dimension of spatially-enabled web enterprise platform would not appear supported at present in either case study firm. The reason is that such a platform is either too ambitious or too costly for the small enterprises to implement. For this dimension to have importance for small businesses, either its cost and complexity would need to be reduced, or its benefits would need to become more compelling than they are now. The last dimension of extent customer-facing, which was not significant for GIS strategy in a larger sample of businesses (Pick, 2008), does not seem of importance here to achieving GIS competitiveness. Also, the two small firms are stretched financially to afford having GIS internally, so could not presently afford the investment in customer facing GIS.

**CONCLUSION**

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This study has focused on the potential for GIS in small enterprises. It has examined cases for two organizations in an exploratory study. The findings are largely supported by the literature that was cited for small businesses. Returning to the research questions, the findings for this preliminary study involving these two cases leads to the following answers to the research questions.

1. What is the state of readiness of small enterprises in developing and implementing GIS applications?

Small enterprises are seen to lack readiness for GIS. The most important barriers to using GIS and spatial technologies in small enterprises were seen to be: cost, insufficient training, lack of management knowledge of GIS, lack of skilled workforce. In addition, our findings have shown lack of time available in their limited workforces to make use of GIS, and lack of conviction about the importance of GIS versus other key goals.

2. What strategic frameworks are relevant to small enterprises in developing, implementing, and succeeding with GIS applications?

The IT alignment framework is relevant because it cautions against using GIS and spatial technologies unless there is clear association of business and IT/GIS goals. The Business-IT-GIS alignment framework is relevant because if the IT and GIS functions are separated in function in a small business, then the management of GIS becomes much more complicated and may defeat it as a strategy. This was the case with ABC Blinds. The evolutionary framework for GIS strategy is relevant in emphasizing the key aspect of extent of geography in the business. For the two cases, geography had large extent in the business, particularly for the land appraisers, so that pointed to GIS as potentially important strategically. The influence of the spatially-enabled web integration platform is reduced for small business by the high relative cost of doing this through an outside commercial service, or by the complexity in implementing it in-house, which far exceeds the skill capacity of the employees in the case firms. The two cases reinforce prior findings that extent customer-facing does not influence GIS’s strategic importance. For these organizations, GIS was internal-facing, yet equally compelling customer-facing examples have been documented for small businesses, such as MotionBased Technologies and Prudential Preferred Realty (Pick, 2008).

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