The Use of Business Intelligence Systems in Australia

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Abstract

Business Intelligence (BI) systems are information systems that combine operational data, models, analytical tools and user interfaces to generate information to support business decision-making. BI is an important part of IT practice and is currently the highest technical priority for chief information officers. As there is to date no published academic research on the nature of BI practice we commenced an exploratory study of the area. A survey of business and IT professionals was used to test fourteen propositions about the nature of BI system adoption, development, use, and governance in Australia. This paper reports on the slice of results related to BI system use, including findings related to six propositions about the nature of BI system use. The survey highlights the critical role of BI in organizations, which justifies research effort into the area, as well as organizational spending on BI implementations.

Keywords

Business intelligence, use, user, business and IT perspectives.

INTRODUCTION

Business intelligence (BI) is a process, usually enabled by information technology, which aims to provide decision-makers with relevant and timely information for business decision-making. BI systems support this process by combining operational data, models, analytical tools and user interfaces to generate information in an appropriate form. As such, they can be thought of as the next generation of decision support system (DSS), with particular similarities to executive information systems (EIS) (Arnott and Pervan 2005; Gray 2003). However, as described by Gray (2003), the increased scale and improved analytics of BI systems, enabled by technological advances in real-time data warehousing and data mining, represents something new in BI. The practice of BI also recognizes that decisions are made at many organizational levels, not just the executive level, and so the new class of BI systems were aimed at serving a much broader population within the organization. According to Eckerson (2006), the initial goal of BI was to give end-users 'self-service' access to information so that they did not have to rely on the IT department to generate custom reports.

Since the practice of BI emerged in recent years, the area has become one of the top technology priorities for organizations (Luftman, Kempaiah, and Nash, 2005; Morgan, 2007). Despite fluctuations in the IT industry, BI and data warehousing vendors continue to report substantial profits and revenue growth. In early 2006, Gartner Incorporated predicted that new license revenue in the worldwide BI software market would reach $2.5 billion in 2006, a 6.2 percent increase from 2005, with continued growth to a projected $3 billion in 2009 (DMReview.com, 2006).

There has been no published research on the nature of BI practice. As the first academic survey of BI practice, our project explored a relatively unknown area of practice by asking, what is the nature of BI adoption, development, use, and governance in Australia? This paper reports on the "use" aspect of the exploratory study. The topic of BI system use holds particular interest because of the wide range of decisions that may be supported by BI, the variety of ways this can occur, and the likelihood of users being powerful, and therefore discretionary, in their use of BI. This paper is organized as follows: the next section reviews the literature relevant to BI system use. The literature analysis is then used in the development of propositions about the area. The research method and design is then outlined, and then the results are presented and discussed. The final section draws conclusions from the discussion and suggests directions for future work.

PREVIOUS RESEARCH AND PROPOSITIONS ON BI SYSTEM USE

The limited number of BI publications are typified by non-empirical research aimed at providing a conceptual overview of BI (for example, Gray 2003; Jagielska, Darke, and Zagari 2003; Negash, 2004). Vendor-driven publications and white papers, though far more prevalent, often define BI and its capabilities to coincide with their particular product offerings. Therefore, this section draws on the broader DSS literature, particularly EIS, to explore themes related to BI system use.

The use of BI systems, like any information system, is a multifaceted area of research. The study of user demographics is one branch of research that provides insight into system use. Bergeron and Raymond (1992) and Singh, Watson, and Watson (2002) found that most EIS users hold senior positions within the organization. Singh et al (2002) reported that their primary area of work experience was mainly planning and finance/accounting. Similarly, several studies report the average number of EIS users, such as Salmeron (2002), who found 69% of EIS in large Spanish businesses had between 10 and 50 users. Rainer, Snyder and Watson (1992) compared the average number of EIS users over time for systems with different sources of software and found that custom-built, vendor and hybrid sources of EIS software had a similar number of users and the number grew from about five initially, to about 50-60 after two years.

In terms of the purpose of BI system use, several studies have investigated how and why EIS are used. In a study of whether executives use their EIS for searching or scanning activities, that is, whether they seek answers to specific questions, or scan without a particular question in mind, Vandenbosch and Huff (1997) found that 75% of executives in their sample did not use their EIS for scanning. Other studies such as Vlahos, Ferrat and Knoepfle (2004), have examined the value of an EIS for fulfilling Minterzberg's (1973) decision roles, and for completing different steps in the decision making process. Singh et al (2002) investigated the value of EIS for supporting certain phases of the strategic management process (SMP). Through these studies, it emerges that EIS are most useful for executives in their role of Resource Allocator, and for the decision making step of evaluating the outcomes of each alternative (Vlahos et al. 2004). Singh et al. (2002) also found that successful EIS support two of the five SMP phases – strategy implementation, and the formulation of organizational objectives.

Another area of research that is inextricably linked to system use is system success. In their well-cited model of IS success, DeLone and McLean (1992) include use and user satisfaction as categories of factors in IS success. System use is particularly relevant to the field of DSS, as executives are typically in a position where they can reject an EIS (Singh et al 2002). Therefore, many studies have measured various aspects of use, such as motivation to use (DeSanctis, 1982), frequency of use (Hsieh, Lu and Pan, 1992), and the number of DSS features used (Green and Hughes, 1986) as surrogate measures of the success of a DSS.

A key element of the various definitions of system success (eg. Markus and Mao 2004; Lucas, Ginzberg and Schultz, 1990) is acceptance of the system by users. Davis (1989) hypothesized that user acceptance is determined by two variables: perceived usefulness and perceived ease of use. Davis' studies found that usefulness and ease of use were correlated with usage, but the link with usefulness was significantly stronger. In addition, Davis' regression results suggest that usefulness mediates the effect of ease of use on usage. The concepts of perceived ease of use and perceived usefulness have also been applied to BI, and were used as the two criteria to validate PUZZLE, a prototype BI system developed in a study by Rouibah and Ould-ali (2002).

In addition to performing a useful function, which leads to the system being used, user satisfaction is also frequently used as a surrogate measure of system success (DeLone and McLean, 1992). Bergeron and Raymond (1992) studied EIS users' level of satisfaction with certain characteristics of the EIS on a five-point Likert scale. They found that the sampled executives were significantly more satisfied with the quality of information and user-interface attributes than with the benefits and technical capabilities of their systems. Similarly, Hsieh, Lu, and Pan (1992) used a five-point Likert scale to measure overall DSS user satisfaction in Taiwan.

User satisfaction has also been studied in relation to task structure (Gelderman 2002) and users' level of experience (Bergeron, Raymond, Rivard, and Gara 1995). Bergeron et al. (1995) also explored the relationships between EIS experience, internalisation of EIS use, and the frequency of use. Their results did not support their hypothesized relationship between EIS experience and satisfaction, and in fact, one factor of EIS experience (satisfaction with assistance), was found to have a negative relationship with satisfaction.

Another relevant factor in the use of BI systems is decision-making style. A study by Elam and Leidner (1995) examined EIS adoption, use, and impact using a decision-making framework, which suggested that decision-making style is a relevant factor. "Decision style and its relationship to strategic decision making has long been of interest to management researchers. Research has shown that managers do have different styles (Jung, 1923; Mintzberg, 1976; Rowe and Mason, 1987) and these styles do affect the way they conduct their day-to-day managerial activities, such as problem formulation (McKenney and Keen, 1974), problem solving (Nutt, 1986) and information processing (Huysmans, 1970)" (Elam and Leidner, 1995, p. 96). The judgement and decision-

making reference theories that inform DSS research add further complexity to the understanding of BI system use (Arnott and Pervan, 2005).

This section has summarised some of the themes and issues related to BI use, including user demographics, user acceptance, user satisfaction, and system success. From this analysis a set of six propositions about BI system use was developed. The propositions are:

1. BI systems are used by staff at lower levels within the organization, as well as high-level executives.
2. BI systems are used for both strategic decision-making and operational decision-making purposes.
3. Senior level staff within the organization will use and value the BI system differently to staff at lower levels.
4. Business decision makers use and value BI systems differently depending on their decision-making style.
5. Business decision makers use and value BI systems differently depending on how frequently they use the system.
6. BI system success is related to the perceived usefulness of the system.

RESEARCH METHOD AND DESIGN

Because BI is a relatively new area and has not been widely studied, this project adopts an exploratory approach using survey research. According to Pinsonneault & Kraemer (1993), "survey research is most appropriate when a) the central questions of interest about the phenomenon are "what is happening?" and "how and why is it happening?", b) control of the independent and dependent variables is not possible or desirable, c) the phenomena of interest must be studied in its natural setting, d) the phenomena of interest occur in current time or the recent past" (p. 78).

The first stage of the broader research project, culminated in the development of fourteen propositions about the nature of BI practice in Australia. Informed by the fourteen propositions, general research questions, and the literature review, two survey instruments were developed. The development of the two survey instruments and refinements to the propositions occurred iteratively. Two survey instruments were developed because it was necessary to gain both business and IT perspectives in order to obtain a more complete picture of BI practice. Both of the survey instruments were structured around the phases of BI adoption, development, use, and governance, but the IT version included more detail about development, while the business version focussed more on BI system use. The instruments can be viewed online via www.infotech.monash.edu.au/cdsesr. Despite the potential disadvantages of a low response rate, a mail survey was selected as a cost effective data collection technique for obtaining responses from a wide geographical area.

Both instruments were pilot tested. Two IT professionals tested the IT survey, and two business managers tested the business version. The pilot tests resulted in slight changes to the wording of several questions. Sampling was achieved through a purchased tailored mailing list. The list contained 3,000 names and addresses, half of which were categorized by the mailing list company as "business decision makers" (for the business perspective), with the remaining half classified as "MIS decision makers" (for the IT perspective).

A total of 121 useable responses were returned, consisting of 42 business responses, and 79 IT responses. Given that 168 surveys were returned as undeliverable, the total response rate was 4.3%. However, the true response rate is uncertain. The mailing list for the business sample was made up of respondents that were *likely* to have had experience with BI systems in their organizations. However, recipients without experience were asked to disregard the survey. The number of these discards is unknown. Although a 4.3% response rate would usually be considered low, Sivo, Saunders, Chang, and Jiang (2006), in a study of response rates in IS research, found *Information Systems Journal* published survey research with a response rate as low as 7%, while *MIS Quarterly* published as low as 5.7%, and *European Journal of Information Systems* published a study with a 3% response rate. These are three of the highest rated journals in IS research.

Analysis of variance tests were conducted on demographic variables in order to test the reliability and validity of the instruments and sampling procedure. By dividing the sample into different sizes, ANOVA Half and ANOVA Quarters tests were used to discover whether respondents would fall into similar categories, regardless of the sample drawn. No bias was detected in the IT sample. However, for the business sample there was a slight bias detected in the level of experience with BI, and therefore care must be exercised in generalizing the results from the business sample to the entire population. Likewise, care must be taken in interpreting the generalizability of the results due to the possibility of self-selection bias. However, there is no way of calculating the probability of self-selection bias. The data were analysed using SPSS, and the findings are presented and discussed in the next section.

RESULTS AND DISCUSSION

Before examining the findings in relation to the six propositions, this section presents the demographics of the respondents, and general findings about the BI systems in the respondents' organizations. The findings regarding the propositions on BI system use are then presented in the subsequent sections.

Table 1 below shows the organizational level of the business sample. Slightly more than half the respondents in the business sample are at the managerial level within their organization, with the vast majority of the remainder split evenly between the two highest organizational levels (board director and executive). This indicates a very senior business sample and increases the power of the results.

Table 1. Organizational level of the business sample.

	No.	%
Board Director	9	21.4
Executive	9	21.4
Manager	22	52.4
Assistant Manager	1	2.4
Staff	1	2.4
Total	42	100.0

Similar to the business sample, the IT respondents were also very senior. More than half of the respondents in the IT sample (57.7%) described themselves as an IT Manager, and 84.6% were most closely aligned with one of the three highest level job titles (IT manager, CIO, and IS manager). Most respondents in the business sample (42.9%) were found to be in the area of accounting and finance, a finding consistent with Singh et al (2002) for EIS. The second most common functional area was marketing (21.4%).

Figure 1 shows the distribution of responses for how much experience (in years) the business decision makers have had with BI systems (in their current or previous jobs) (Min=0.00, Max=35). They are surprisingly experienced with BI, as Figure 1 demonstrates. Twelve of the respondents reported having more than 20 years experience with BI systems, which tends to suggest the they are thinking of BI systems as including DSS and EIS. The average number of years experience with BI systems for business respondents was 13. Developers and IT departments should therefore not underestimate the level of experience of the users. Highly experienced users should participate in all aspects of development, such as project management, training, and determining system requirements.

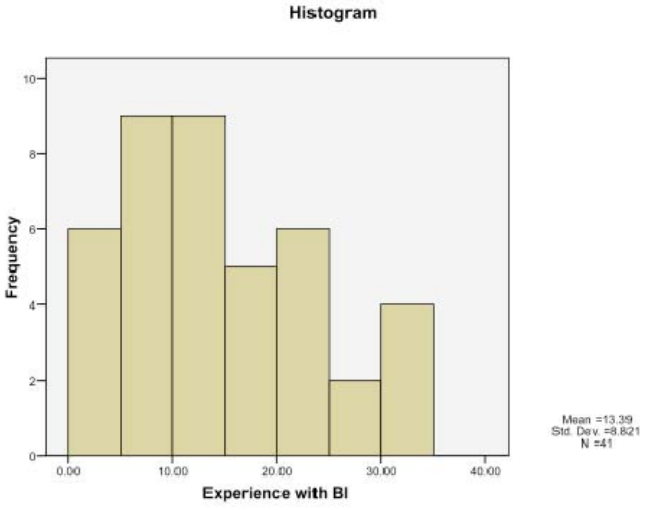

Figure 1. Years of experience with BI systems (business perspective)

In terms of the industry of the organizations, the most common primary industry across the entire sample was manufacturing (32.2%), with 52.4% of business respondents falling into this category. Although the respondents in the business sample operate mostly in accounting and finance, none of the respondents reported banking/finance as the primary industry of their organization. With regard to the annual revenue of the organizations in the sample, the average was approximately $41.6 million (Min=$0.05 million, Max=$500

million, SD=$94 million). Table 2 below shows the breakdown of the sample according to categories of average annual revenue.

Table 2. Breakdown of average annual revenue

Annual revenue	Business	IT	Total
$0 - $20 million	23	2	25
$20 - $100 million	5	25	30
$100 - $500 million	3	21	24
$500 million - $1 billion	0	4	4
More than $1 billion	0	10	10
Total	31	62	93

Examining the features that are used can provide insight into the way users use their BI systems. The basic features of BI systems were found to be quite widely used, for example, the ability to drill down to retrieve detailed, lower level data, and having graphic, tabular and textual data on one screen. However, the more advanced features of BI systems, such as predictive analysis/what-if and exception alerting, are less frequently used. Only 14% of business respondents use predictive analysis/what-if functionality, which suggests that the full potential of BI systems is not realized. They are not widely used as an analytical tool despite how vendors position them. Interestingly though, most business decision makers (52.4%) classify themselves as analytical decision makers, that is, they employ a logical approach to tasks and problems, rather than being action oriented (directive decision makers), or focusing on the people aspects of a problem (behavioural decision makers). Therefore, perhaps 'analytical decision makers' prefer their own personal analysis approach, probably supported by a spreadsheet, rather than using the BI system as an analytical tool.

Table 3 presents the business perceptions of the BI system's usefulness and ease of use, according to a five point Likert scale, where five is the most positive score (very useful, or very easy to use). The findings show that the business respondents tend to rate their BI systems higher on perceived usefulness than perceived ease of use. Table 4 shows the IT perspective on how users in their organizations perceive their BI systems, according to usefulness and ease of use. It is interesting that although the business respondent scores were higher that the IT respondents, particularly for perceived usefulness, both groups rate the system similarly on overall success (M= 3.44 out of five for business respondents, and M=3.47 for IT respondents).

Table 3. Perceived usefulness and ease of use (business perspective).

	Min	Max	Mean	St. Deviation
Perceived usefulness	3	5	4.10	0.656
Perceived ease of use	1	5	3.45	0.889

Table 4. Perceived ease of use and usefulness (IT perspective).

	Min	Max	Mean	St. Deviation
Perceived usefulness	1	5	3.59	0.913
Perceived ease of use	2	5	3.42	0.810

The next tables give an indication of the value of the BI system to the business respondents, for different decision roles, decision-making steps and tasks. Table 5 shows that the business sample gains the most value from the BI system in the role of Resource Allocator, which is consistent with Vlahos et al's (2004) finding for EIS. Table 6 indicates that BI systems are most valuable for identifying problems or issues, and least valuable for generating alternative courses of action. In comparison, Vlahos et al (2004) found that EIS were most valuable for evaluating the outcomes of each alternative. Table 7 supports the finding that BI systems are particularly valuable for identifying problems or issues, with the finding that 'identifying potential problems faster' is the most valuable advantage of BI systems in relation to certain tasks.

Table 5. Decision roles supported by BI systems.

	Average rating (1-5)
Entrepreneur	3.76
Disturbance Handler	3.83
Resource Allocator	4.02
Negotiator	3.71

Table 6. Decision-making stage supported by BI systems.

	Average rating (1-5)
Identifying problems or issues	3.79
Generating alternative course of action	2.83
Evaluating the outcomes	3.62
Ranking alternatives and choosing one	3.02
Implementing the chosen alternative	3.10

Table 7. Extent to which the BI system has helped with certain tasks.

	Average rating (1-5)
Identify potential problems faster	3.71
Sense key factors impacting your area of responsibility	3.60
Notice potential problems before they become crises	3.43
Make decisions quicker	3.64
Spend less time in meetings	3.45

In terms of the organization's amount of investment in IT to support managerial needs, the business responses ranged from one (less than adequate), to five (more than adequate), with a mean score of 3.48 (N=42, SD=0.994). When asked how important the system was overall for making decisions that are critical to the success and effectiveness of their managerial duties, business responses ranged from two to five (five being of great importance), with a mean score of 3.86 (N=42, SD=0.751). This is an important finding as it provides solid evidence that BI systems play an integral role in the success and effectiveness of organizations. This justifies both research effort and organizational expenditure in the area of BI.

The frequency with which the business respondents use BI systems is reported in Table 8 below. None of the business respondents reported using the system less frequently than monthly.

Table 8. Frequency of BI system use.

	No.	%
Daily	30	71.4
Weekly	6	14.3
Monthly	6	14.3
Total	42	100.0

Results on the degree to which BI system use is 'internalised' are presented in Table 9. The table suggests that the business respondents have a high degree of internalisation of system use, with scores for each item above three. Particularly high is the average rating score (4.26) for the first item, 'not using the system anymore would disadvantage me'. Again, this finding is evidence that BI systems provide a significant advantage to users, and therefore for their organizations.

Table 9. Internalisation of system use.

		Average rating (1-5, 5= strongly agree)
A	Not using the system anymore would disadvantage me	4.26
B	I use the BI system to accomplish my usual tasks	3.83
C	The system allows me to have a high level of control over the activities of my organization	3.48
D	I use the system to identify trends and to obtain critical info concerning my dept./division	3.71
E	I use the system to identify trends and to obtain critical info about my org's environment	3.45
F	I make strategic decisions relying on reports generated by the system	3.62

Turning to the IT perspectives on BI system use, Table 10 shows the levels of staff that can use the BI system (N=79). The respondents were asked to tick as many categories as applied. Based on these results, it can be summarised that most levels of staff can use the BI system, including lower levels, such as those classified as 'Assistant Manager' and 'staff'. This gives some strength to Proposition 1, which stated that BI systems are

used by staff at lower levels within the organization, and suggests that the notion of BI for the masses is gaining momentum.

Table 10. Level of staff that can use the BI system.

	No. of respondents	%
Board Director	22	27.8
Executive	66	83.5
Manager	74	93.7
Assistant Manager	62	78.5
Staff	61	77.2

Table 11. Functional area of staff that can use the BI system.

	No. of respondents	%
Accounting & Finance	63	79.7
Operations	59	74.7
Sales	42	53.2
Administration	40	50.6
Corporate Headquarters	36	45.6
Customer Services	35	44.3
HR	34	43.0
Marketing	31	39.2
Manufacturing	15	19.0

Table 11 shows the functional area of staff that can use the BI system (N=79). Again, respondents were asked to tick as many functional areas as applied. The average number of active users of the BI system, according to the IT sample (N=75) was 132.59 (Min=1, Max=2000, SD=316.187). This is generally more than previous findings in terms of the number of users of EIS (for example, Rainer, Synder and Watson, 1992; Salmeron 2002).

Having explored general findings about BI system use and the sample of respondents, the next sections present the relevant findings in relation to the six propositions on BI system use.

Proposition 1

The seniority of the business sample, as shown in Table 1, would tend to discount Proposition 1, that BI systems are used by staff at lower levels within the organization. However Proposition 1 cannot be discarded based solely on this finding, as the way the survey was administered was targeted to business decision makers, that is, people who are likely to be senior within the organization. Therefore, the IT perspective on the levels of staff that may use the BI system, as found in Table 10, is also relevant to Proposition 1. Table 10 shows that in most of the organizations in the IT sample, a broad range of staff are able to use the BI system, including those classified at the most junior level, as 'staff.' This finding offers reasonable support for Proposition 1.

Proposition 2

Evidence in support of Proposition 2, that BI systems are used to support both strategic and operation decision-making, can be found in several tables. In Table 11, three quarters of the IT people also reported that BI systems can be used for operations in their organizations, and given that most of the organizations in the sample were manufacturing organizations, these results tend to suggest that BI systems may frequently be used to support operational decision-making, such as scheduling decisions, and comparing production output by area, shift, and machine to isolate problems and improve productivity. This finding contributes support for the idea that BI systems are used for operational decision-making, as does the finding that they are used mostly on a daily basis (Table 8), and also by lower level staff (Table 10). However, that BI systems are also used by senior staff, who rate them as highly important for making decisions that are critical to the success and effectiveness of their managerial duties, and that on average, business respondents agree that they make strategic decisions based on reports generated by the BI system (Table 9), is evidence that BI systems are also used for strategic decision-making purposes. Therefore, Proposition 2, that BI systems are used for both strategic decision-making and operational decision-making purposes, is supported.

Proposition 3

In addition to the descriptive statistics already presented, further analyses were conducted to test for possible differences in the way the most senior level business respondents perceive BI systems compared to lower level business respondents (as proposed by Proposition 3). The respondents were categorized as high level if they were board directors or executives. Managers, assistant managers and staff comprised the lower level group.

A series of independent samples t-tests were conducted to compare the means of the high and lower level groups for the different task activities (Table 7), decision-making steps (Table 6), and internalisation scores (Table 9). There were no significant differences detected between high level and lower level business respondents on any of the tasks activities or decision-making steps. One significant difference was found in scores on Internalisation C (the system allows me to have a high level of control over the activities of my organization) for high level respondents (M=3.89, SD=0.963) and lower level respondents [M=3.17, SD=0.917; t(40)=2.472, p=0.018). The magnitude of the difference was quite large (eta squared = 0.133). This is a very predictable, logical result, as it would be expected that high-level users would place more emphasis on gaining control over the activities of the organization than lower level users. Given that this was the only significant difference between the high and lower level staff, Proposition 3 is not supported.

Proposition 4

A series of one-way ANOVA tests were conducted to test for differences in the way business decision makers with different decision-making styles use and value the BI system, as suggested by Proposition 4. There were only four respondents that classified themselves as having a behavioural decision style, and due to the small number in this category, it was excluded. Internalisation A (not using the system anymore would disadvantage me) was selected as the first dependent variable. The results showed no significant differences between the decision-making styles for Internalisation A scores. Another ANOVA was conducted using the score for overall importance for making critical decisions for managerial duties as the dependent variable. Again, there were no significant differences detected. Therefore, there was no support found for Proposition 4, that decision makers use and value BI systems differently depending on their decision-making style.

Proposition 5

To test Proposition 5, that business decision makers use and value BI systems differently depending on how frequently they use the system, a one-way analysis of variance was performed on the business sample to see if there is a difference in the degree of internalisation of BI system use depending on whether the system is used daily, weekly, or monthly. Levene's test revealed the homogeneity of variance assumption was not violated. Statistically significant differences were detected between the groups in Internalisation B, C, and F, and they are described below.

There was a statistically significant difference at the $p<0.05$ level in Internalisation B (I use the BI system to accomplish my usual tasks) scores for the three groups [F(2, 39)=10.802, p=0.000]. The actual difference in mean scores between the groups was large. The effect size, calculated using eta squared, was 0.356. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Internalisation B for users that use the system on a daily basis (M=4.20, SD=0.805) was significantly different from users that use the system on a weekly basis (M=2.83, SD=0.983) and users that use the system on a monthly basis (M=3.00, SD=0.632). Monthly and weekly users did not differ significantly in their Internalisation B scores.

There was also a statistically significant difference at the $p<0.05$ level in Internalisation C (the system allows me to have a high level of control over the activities of my organization) scores for the three groups [F(2, 39)=3.944, p=0.028]. The actual difference in mean scores between the groups was large. The effect size, calculated using eta squared, was 0.168. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Internalisation C for business respondents that use the system on a daily basis (M=3.67, SD=0.884) was significantly different with respondents that use the system on a weekly basis (M=2.50, SD=1.378). Monthly users (M=3.50, SD=0.548) did not differ significantly with either daily or weekly users.

There was also a statistically significant difference at the $p<0.05$ level in Internalisation F (I make strategic decisions relying on reports generated by the system) scores for the three groups [F(2, 39)=6.465, p=0.004]. The actual difference in mean scores between the groups was large. The effect size, calculated using eta squared, was 0.249. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Internalisation F for respondents that use the system on a daily basis (M=3.87, SD=0.730) was significantly different with users that use the system on a weekly basis (M=2.50, SD=1.378). Monthly users (M=3.50, SD=0.837) did not differ significantly with either daily or weekly users.

Proposition 6

In order to test Proposition 6, that BI system success is related to perceived usefulness, the overall success rating scores were correlated with the perceived usefulness scores, using Spearman's rank-order correlation coefficient. There was a moderate positive relationship found between BI system success and perceived usefulness (r=.489, p<0.005, N-115). Therefore, Proposition 6 is supported.

CONCLUSION

The rationale for this project was that business intelligence is one of the top IT priorities in organizations today. Large-scale BI and data warehouse projects are absorbing high investments as organizations grapple with getting the best use out of their information. Despite the growth of the BI market and its importance in industry, the area has not been widely studied. Therefore, as the first survey of the area, this project is an initial step towards understanding the nature of BI practice. To the extent that Australia is typical of OECD countries the results can be generalized to other developed countries. This paper focused on the area of BI system use, and the key findings are summarised below:

- Senior managers and executives in the sample are very experienced with BI;
- BI systems exist mainly in larger organizations, often in the manufacturing industry, and users often function in accounting and finance;
- BI systems are highly important to business respondents for making decisions that are critical to the success and effectiveness of their managerial duties;
- Although most business decision makers classify themselves as 'analytical decision makers' the predictive analysis/what-if functionality of BI systems is not often used;
- BI systems provide the most value to business respondents in resource allocation roles;
- BI systems are valuable for identifying problems or issues, and particularly for doing so faster;

Table 12 presents the findings in terms of the six propositions. The assessment of the level of support was determined on a scale of none, weak, reasonable, or strong, based on the statistical analysis of results and the interpretations as discussed.

Table 12. Levels of support found for the propositions

		Level of support
Proposition 1	BI systems are used by staff at lower levels within the organization.	Reasonable
Proposition 2	BI systems are used for both strategic decision-making and operational decision-making purposes.	Strong
Proposition 3	Senior level staff within the organization will use and value the BI system differently to staff at lower levels.	None
Proposition 4	Business decision makers use and value BI systems differently depending on their decision-making style.	None
Proposition 5	Business decision makers use and value BI systems differently depending on how frequently they use the system.	Strong
Proposition 6	BI system success is related to the perceived usefulness of the system.	Strong

The main findings were that BI systems in Australia are highly important to business decision makers for making decisions that are critical to the success and effectiveness of their managerial duties. It was also found that using a BI system has become quite an integrated part of the way managers work, as they are used mostly on a daily basis, and for both strategic and operational decision making. There was also overwhelming agreement among the business respondents that not having a BI system would disadvantage them. BI systems were found to be particularly valuable for identifying problems and issues, and for doing so quickly. There appears to be no differences between the way respondents use and value BI systems depending on their level of seniority within the organization, or their decision making style. Another important finding was that above all other factors, it seems to be the perceived usefulness of BI systems that determine their success. This highlights the importance of ensuring that the system meets the requirements of the user.

This paper has explored the issue of BI system use using a survey of business decision-makers and IT professionals. Further research, perhaps in the form of case study research using the propositions as focussing lenses, is necessary in order to provide a richer view of BI practice.

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