

Decentralizing Data Through Decision Support Systems: The Impact of Increased Access to Data on Decision-Making

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Abstract

This study examines the impact of a new Decision Support System (DSS) on decision-making. It looks at how attitudes and behaviors about data and its uses were impacted by the implementation of the new DSS. We found that the decentralization of data, which was created by an increased availability of data, produced a shift in how individuals imagined their own role in using data for decision-making. The use of the DSS introduced a new model that allowed users to be in control of the data they produced, which in turn, impacted how data and decisions were approached throughout the district.

Introduction

City College of San Francisco (CCSF) is a large, urban community college district with 2,400 employees; it serves more than 95,000 students annually in over nine campuses. In 1998, CCSF invested in a new information system that gave individual departments the ability to access data from their desktops via a new college intranet. The system was used primarily by departments that had hired technical specialists who could download data and information on an as-needed basis. However, because most departments could not afford specialists, they had to either make a request directly to the institutional research office, wait until a programmer generated the report for the department, or navigate a complex set of rules to access the data via the information system (Gabriner, 2001).

The institutional research office, similar to other research offices across the state, is responsible for reporting data on a growing number of state and federal mandates that involve institutional accountability. In 2001, the institutional researcher office rolled out a new decision support system—a web-based interface that linked directly to a data warehouse, containing student data from Spring 1998 to the present. This study examines the impact of a new Decision Support System (DSS) on decision-making. It looks at how attitudes and behaviors about data and its uses were impacted by the implementation of the new DSS. Our interest in choosing to look at the impact of the DSS on decision-making was to find out, if in fact, increased access to data has had an affect on the way that decisions have been approached since the introduction of this new desktop research tool.

Background on Decision Support Systems

Institutions of higher education have been recognized as complex and high-pressure decision-making environments (Harmon, 1986). The use of decision support systems in higher education emerged as a response to the increasing demand for direct data access within higher education institutions (Frost, Dalrymple and Wang, 1998). Decision-support systems have historically brought together data resources in order to better

facilitate data-use on multiple levels (Metz and Cosgriff, 2000). Additionally, recent advancements in computer technologies in business and government have allowed non-specialists to make better use of data analysis (Lilly: Hallett, 2000).

On most campuses, prior to the introduction of a decision support system for users across the institution, data had been concentrated within central administrative offices. As a result of this centralized structure, these offices often experienced an overload of requests for data from individuals, thereby creating an unmet need for data (Frost, Dalrymple and Wang, 1998; Serban, 2002; Wells, Silk and Torres, 1999). At the institution level, the implementation of a decision support system serves to rectify this problem by placing data directly in the hands of those that need it. This comes at a time when more people are being asked to respond to inquiries based on data rather than on intuition (Wells, Silk, and Torres, 1999).

Research has demonstrated how easier access to data within institutions of higher education affects how people use them (Chan, 1999; Pickett and Hamre, 2002). Some research suggests that decision support systems can help users develop more sophisticated means of analyzing and interpreting data (Harmon, 1986). This ease of access can stimulate users to look at data with a new sense of familiarity and understanding; data is regularly at their disposal and not simply handed to them without an understanding of how the data were retrieved. In turn, users may be encouraged to pose new questions and queries, thus stimulating ongoing investigation throughout the institution. As a result, some research has shown that better access to data stimulates ongoing questions, greater demands for data, and more sophisticated analysis (Frost, Dalrymple and Wang, 1998; Hallett, 2000; Harmon, 1986).

Methods

This study is based on a series of in-depth interviews with 27 administrators, faculty, and staff at City College of San Francisco (CCSF). The interview participants were selected from a non-random sample that was determined by identifying a cross section of administrators, faculty and staff who had used the district's Decision Support System (DSS) between June 2001 and February 2002. Because we wanted to look specifically at the shift in data retrieval since the DSS was introduced in 2001, we eliminated any participants who had been employed by CCSF for less than two years. The sample chosen represented individuals from a wide range of departments and positions across the college.

We made our final selection of participants from the larger group of DSS users in order to include a spectrum of users, which was based on the number of times the individual had accessed the DSS in the nine months prior to the start of the study in February 2002. This allowed for us to interview a cross-section of DSS users—ranging from those who had used the system only once in nine months, to those who used it more regularly. Table-1 presents a summary of the final group of participants that were selected, organized by the number of times that each group logged onto the DSS from June 2001 through February 2002.

Table 1. Summary of DSS User Categories

Number of Months Accessed DSS Between 6/01-2/02	Number in Sample
Used DSS during 4 or more months	12
Used DSS during 3 months	8
Used DSS during 1-2 months	6
Did not access DSS themselves, but were users of DSS data	1
Total interviewed	27

The interview protocol asked participants to recall specific times when they gathered student data through the currently available technologies—both before and after the implementation of the DSS. We did this in order to understand, retrospectively, if attitudes and behaviors about data and its uses had changed since the introduction of this new desktop research tool. We asked participants to recall the context of those incidents, and finally whether the incident had a successful or unsuccessful outcome. This enabled us to take a snapshot of what types of data had been requested over the past year and, most importantly, to identify the processes undertaken by information seekers to get the data they needed. We used the critical incident technique in order to elicit examples and outcomes about actual behaviors that relied upon specific recall, thereby bypassing hypothetical situations.

After the interview data were conducted and transcribed, a set of comprehensive codes were developed. We used a qualitative data analysis software tool to associate codes with pieces of text, to search these codes for patterns and reoccurring themes, and finally to construct classifications of codes that reflected the conceptual structure of the underlying data.

Improved Access

Participants reported that prior to the introduction of the DSS at CCSF, it was difficult for them to regularly access student data. There were numerous examples of individuals going to great lengths in the pre-DSS era to get up-to-date enrollment counts and accurate data concerning student demographics. Some participants also mentioned that prior to the DSS, they simply did not know where to go to get the data that they needed. As might have been expected, the research office was often required to broker the data—offering the technical expertise it took to access the data stored in the existing system and give it to individuals who did not possess the necessary expertise or training to do it for themselves. The result was that individual requests had to wait in a queue for the institutional research office to fulfill the request.

When asked what they did before the introduction the DSS, several participants reported that they either simply did not use data, or they used the only data that they had, which in some cases, had been produced years before. This discouraged participants from relying on data since they knew it was out of date. Explained one participant, when asked how they accessed student information prior to the DSS:

We didn't. I used 1993 data... That's what I did. I had an information sheet about students... it was a paper survey and that was sort of the data that we were using and just hoping that it didn't change, [that it] hadn't changed too much.

Another participant said:

Research was able to [provide] a zip code report so we would know where the bodies came from at least. So we could still go to institutional research and ask for some of the information, but it just took more time.

A common sentiment among participants was a reported shift in people's perceptions of data in general. According to participants, historically, data had not been widely accessible which led to a mistrust and avoidance of data use. However, participants spoke of how they felt there had been a shift in this perception since the data had become more widely available with the introduction of the DSS. Prior to the DSS, when data were requested, they were simply handed down from administrative offices without a clear sense of how the data were defined or aggregated, leading to the suspicion that certain "agendas" may have been attached to the data. The introduction of the DSS made the data in this system not only more useable but also more transparent, allowing for individual analyses, and making clear certain processes that had previously been opaque. Said one participant:

Well, before we had access to things like DSS, it was all given to us and it was given to us usually from sources that we didn't trust in the first place, [from sources] that we believed had agendas and that we were not getting the whole picture about enrollments, among other things.

In this way, the DSS appeared to introduce a newly accessible and democratized form of data that relieved some of the tensions regarding how data had been disseminated in the past.

The Impact on Decision-Making Processes

One of the issues that we were interested in was how access to the DSS data impacted decision-making throughout the district. Specifically, what types of data did people need in their work and how did access to these kinds of data that were available in the DSS impact their on-going work? We found that participants used the DSS for a number of specific purposes. These centered on being able to track enrollments, make arguments for increased resources (including new hires and additional funding) and finally, to provide, what, as one participant called, "artillery" for arguing a point or making a case with others. While enrollment management was most frequently cited as the reason a participant used the DSS, having the ability to substantiate one's argument with data was cited most often as the reason someone used the DSS in the first place.

For example, there were several examples of participants' success in acquiring a more complete picture of how enrollments were taking shape at the beginning of a semester. One participant in particular spoke of how this had affected her decision-making regarding the decision to open up new sections when needed, and how she was better able to serve her students because of this. She explained:

We know in a general way that we turn students away, that sometimes we just don't have enough seat space for everyone who wants to take the classes. But putting a finger on where the most unmet demand is was basically impossible before the Decision Support System started tracking it for us.

Another participant described how she was able to take basic demographic data and turn it into something that would be useful in the development of her program. Through her analysis of the data available in the DSS, she was able to determine the demographics for those who were traditionally drawn to the program. She said:

Well, the one thing that did change is I finally was able to come up with what I thought was a fairly good profile of who the students in my program are. And I'm currently sort of looking at some of that information and re-evaluating it and attempting to write up a profile of who they are. Knowing who they are allows me, in some ways, to serve them better.

Once she was able to more accurately determine those students that were attracted to the program, she was then able to feed that information back into her current work by recognizing the need to market the program to a wider audience. She explained:

It also reveals who's not being served by our program... So it tells me that we may have to step up efforts with recruitment and/or just plain encouragement of people who don't meet that profile – telling them about opportunities that may be available, making sure that they're comfortable with the work, and addressing their needs in some other way.

This particular case illustrates the importance of how access to data can impact the organization as a whole through the behavior of individuals who are motivated to improve the functioning of their own departments or programs by using data to inform decision-making.

Moving Towards a Culture of Inquiry

In addition to time saved, participants spoke of how having data at their fingertips allowed them to address problems in new ways. The following participant explained that before the DSS was available, he did not have the ability to simultaneously ponder a specific question about his program and then locate the data that would enable him to further refine his thought process about it. He explained that before the DSS, he had to rely on the institutional research office to provide him with data, which not only placed a barrier between him and the data, but also delayed his decision-making capability. He explained:

It wasn't like I could sit down and say gee, I'm wondering if we should put more classes out in the [location] area. 'Cause in order to get that information, [the institutional research office] had to do extra work so I had to make sure it was a question that I really needed to have answered.

Whereas now you can kind of just put in there different combinations and I think it sort of opens the door to looking at things differently.

While there were some complaints concerning the limitations of the DSS and its capabilities, specifically around the lack of available historical data, in general there appeared to be a growing culture of inquiry at the college. However, even the nature of the concerns indicated a desire to have increased capacity to address problems using data. This culture of inquiry may or may not be as a result of the DSS per se, but the system does seem to be playing a part in how participants imagine their own role in gathering data for decision-making. For example, several participants explained about on-going efforts to fix bad data that had been in the system for several years. They also discussed how the cycle of correcting and using the data was producing a renewed awareness and interest in using data.

The following example illustrates the increased interest in data that was reported, as one participant discusses the shift from using data in reaction to a problem as opposed to proactively questioning issues within the organization. This example is indicative of the ways that several participants discussed using the DSS in this study. She said:

First of all, ... you can use the information in a reactive way, which is the way most people used it. And then you can use it in a proactive way if you're trying to substantiate a vision and sell it—it's important for it. So in a reactive way questions would be—why am I noticing a change in overall student performance? Then you go in, you look at GPAs, you look at English proficiency levels. You look at what high schools they came from. You see if there is a new geographical or socio-economic mix from the zip codes, right? You could look at how many classes they're taking per semester. You could ... what else could you do?

According to this example, using data in a reactive fashion entailed taking notice of change and then looking to find out what the problem is, in this case, by looking at GPAs, English proficiency, etc., whereas access to data allowed her to use data more proactively. This type of behavior may be indicative of a culture in which there are some people who imagine using data to anticipate problems, rather than to simply solve them after the fact.

Conclusion

This study supports prior research that suggests that decision support systems can be used to facilitate data use across organizations, which then leads to a greater demand for data, and perhaps more sophisticated analyses. In this study, we found this to be the case. While there was some enumeration of the limitations of the DSS, such as not providing adequate historical data, there was general agreement that the system had not only changed the way things were done, but also the speed with which they could be done.

The introduction of DSS, which was equally available to all faculty and staff, appears to have been accompanied by a shift in people's perception of data, in terms of helping to substantiate claims for additional resources, as well as to help dismantle, albeit slowly, pre-existing negative attitudes concerning the use of data. By introducing a decentralized

research tool, such as the DSS, CCSF has been able to introduce a new model of data-use that allows users to be in control of the data they produce.

While previous studies have explored how new decision support systems affect day-to-day operations, this study looked more broadly at how, and if, this organization experienced changes in how data were used for decision-making. CCSF has benefited from the DSS not only in increased effectiveness of data dissemination, but also in a deeper shift in attitudes toward the use of data—an attitude that can be sustained through its technology resources and grown over time.

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