

A TAXONOMY OF A DECISION SUPPORT SYSTEM FOR PROFESSIONAL SPORTS

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ABSTRACT

This paper develops a taxonomy of Decision Support Systems (DSS) for professional sports. The authors utilize the traditional DSS structure –a nine cell matrix. A great deal of the literature on DSS focuses on specific applications to traditional businesses, governments or not-for-profits and tends to discuss a very narrow category or application. In contrast, this paper transcends the entire spectrum of DSS applications with the particularly innovative focus on professional sports. Most observers will concede that professional sports are in fact a business and, therefore, amenable to analysis via a DSS framework. In this paper we present both data driven and model driven examples of DSS applications to professional sports.

Keywords: DSS, professional sports, structured decisions, semi-structured decisions

What is a DSS?

There is no universally agreed to definition of a Decision Support System (DSS). However, Peter Keen captured a reasonable perspective in a 1980 article as follows:

“Personal systems to assist the manager must be built from the manager’s perspective and must be based on a very detailed understanding of how the manager makes decisions and how the manager’s organization functions.”(8)

DSSs can be viewed as an approach or a philosophy rather than a precise methodology. The work of Alter comes to mind as a DSS researcher who did seminal work in this area . (1) If you accept this viewpoint, then we can use Turban, et al.’s components and structure of a DSS as a working perspective. They posit that a DSS is composed of the following components:

- (a) Data Management
- (b) User Interface
- (c) Model Management
- (d) Knowledge Management.(15)

A great deal of the literature on DSS focuses on specific applications to traditional businesses, governments or not-for-profits and tends to discuss a very narrow category or application. In contrast, this paper transcends the entire spectrum of DSS applications with the particular focus on professional sports. The use of IT in a DSS for professional sports has not been a very well-researched subject. There have been articles in trade publications but they are generally written for a non-technical reader (3, 14).

A Model Driven vs. Data Driven DSS

Decision Support Systems have evolved along two parallel trajectories. Alter developed a taxonomy based on “the degree of action implication of system outputs.”(1) He stated that “these generic operations extend along a single dimension ranging from extremely data oriented to extremely model oriented.”(1) The model driven DSS has an analytical engine at its core and is customarily grounded in a well-defined theoretical construct. When applying this type of a DSS, a decision-maker relies on the quality and robustness of the underlying model employed. A good example of this type would be the employment of an optimization model in professional hockey to determine the optimal time in the last period to pull the goaltender when a team is behind in the score. Another example, this time from professional football, would be to determine the optimal call for a quarterback on third down and short yardage.

The alternative approach follows a data driven DSS framework. In these situations the decision maker is characterized by possessing a significant amount of data that is organized in a manner that can be retrieved, summarized, analyzed and reported all in a timely fashion. CRM systems (10), data mining or player statistics databases would be examples of this genre of DSSs. Using OLAP or a DBMS as the underlying “cruncher” would further assist the decision-maker in developing a data driven DSS. An article in CIO by Rosenbaum stated “Grand Slam uses Web Focus to let the browsing fan slice and dice an enormous database of major league baseball statistics...”(11) Inderpal Bhandari, a scientist at IBM Watson Research Center in New York has applied data mining to professional basketball. (4)

Traditional Nine-Cell DSS Matrix

In 1989, Gorry and Scott Morton (6,7) made a significant contribution to the development of DSS theory with the positing of a nine-cell matrix. Figure 1 illustrates the matrix.

	Structured	Semi-Structured	Unstructured
Strategic Planning			
Management Control			
Operational Control			

In this paper we will use the matrix to structure our taxonomy of DSS applications in professional sports. The column headings reflect the degree to which a decision is capable of being put into a structured format that can be used in a repeatable fashion over time. A structured decision is capable of being transformed into a “cookie cutter” framework. At the other end of the spectrum, it is extremely difficult to create a “mold” for unstructured decisions. These tend to be “ad hoc” and very flexible in order to be used by the decision maker.

The three rows represent the continuum of business decisions that reflect long-term or macro issues to a short-term or micro perspective. It should be noted that strategic might be normative in nature but not always long-term.

Users of Decision Support Systems in Professional Sports

Any DSS design must consider the various types of decisions that need to be made and the specific users who are responsible for those decisions. In this section, we discuss generic users without regard to any particular professional sport and proceed to identify several DSS needs of several of them.

Players: Contract negotiations, bragging rights

Coaches: What plays work, develop a game plan, “garbage” time statistics, player tendencies, player combinations

Team Owners and Management: Contract negotiations, arbitration hearings, trades, player draft, prospect lists, CRM for fans, vendors

Fans: Which player is better? Wagering, hot stove leagues, game simulations, sale of databases to fans, Internet as distribution medium, downloads to pubs, dormitories and homes

Media Outlets: In depth analysis of games, game statistics, finding “hidden” relationships in data such as turning points in contest, creative story lines on players

Referees: Review timing and frequency of certain calls, review impact on the tempo of the game, review referee performance (individual and squads)

Scouts: Review upcoming contest’s opposing players and their tendencies in given situations versus players, player combinations and teams

League Officials: Archiving databases of video and data, use in global marketing of the sport, licensing team logos, team equipment, attendance analysis, payroll analysis, maintaining league equity and competitive balance

Taxonomy of DSS for Professional Sports

In this section of the paper we categorize DSS activities according to the nine cell matrix. We use the following framework for the classification process. Structured Decisions are those that are of a routine nature and repetitive. Semi-structured decisions are a hybrid containing some structured components and some that are less so. Finally, unstructured decisions are not cut and dry. They are by nature “fuzzy” and complex. Many are “ad hoc” and not planned for but, nevertheless, must be dealt with when they appear.

Strategic Planning – Structured

Examples in this category include planning for the evolutionary growth of a league. Fan demographics, geographical growth potential, corporate sponsorships, municipal interest must all

be factored into the equation. Also expansion into other countries must be planned for in an orderly manner. Establishment of salary caps, team size (number of players), league size, revenue sharing can be considered as appropriate decisions for this category.

Roth, in a Fortune article, states “Stern’s dot-com vision is to make pro basketball accessible to fans worldwide through their televisions, computers, wireless phones, handheld computers or whatever Internet devices will roll out in the future” (12).

Strategic Planning- Semi-structured

Examples include anticipating an earthquake of varying magnitudes and planning for a change of venue (recall San Francisco and Candlestick Park). The betting scandal in baseball and the steroid investigation in several sports (BALCO) caused a great deal of actions regarding testing and penalties imposed on teams and/or athletes.

Strategic Planning- Unstructured

Decisions in this category are probably the most difficult to support with technology. Examples could include planning for various types of terrorist attacks at sports venues especially during the World Series, Stanley Cup, Super Bowl, NASCAR race, Kentucky Derby or NBA Championship series.

Management Control- Structured

Examples in this category include evaluation of players annually by team owners resulting in salary renegotiation or trades, computing summary statistics at periodic times, providing salary analysis by team, checking compliance to league rules, assessing penalty costs to teams that violate league charters, and providing database support for media outlets in cities where sports teams function. Vicky Kaplan, director of applications and technologies for NBA Entertainment, in Information Week states “NBA statisticians will compile data courtside on pen-based IBM Thinkpads, then ship the info instantly over MQ Series to operators of arena scoreboards and video screens, TV broadcast trucks, the NBA data center in Secaucus, and the Sports Ticker Enterprises wire service. (5)

Management Control- Semi-structured

Examples of this type include adjusting security at venues as terrorist alert levels change, developing and tracking player conditioning / strengthening programs, deciding if particular teams should be sold or cities should be abandoned and replaced with another one. Rebalancing of teams in a particular division to achieve parity can be in this category. Organizing special promotion days with players and advertising sponsors (bobble head, bat, cap days). We can include a program of random drug testing for players in this category.

The use of CRM to capture web activity on team sites, sales data analysis via data mining fall into this category. Koch in a CIO article states “...tapping information into laptops that feed database programs producing baseball’s first generation of true competitive intelligence

empirical data stored on hard drives rather than inside the skulls of the game's devotees.”(9)

Brian James, assistant coach of the Toronto Raptors, “uses his laptop and a data mining application to gauge his team's talent game by game against that of the rest of the NBA....Advanced Scout allows James to easily see which matchups worked, and which ones didn't.”(2)

Management Control- Unstructured

When an athlete comes close to setting a milestone or record a team might engage in a special promotion for the day or a general public relations campaign associated with the event. Examples are the 300th win for a pitcher in baseball, 3,000 hits, 10,000 points in basketball are all worthy of special recognition by teams, fans and the media. Another far reaching application is cited by Useem, in a Fortune article. He reported on “plans to outfit professional athletes with radio transmitters that'll generate a new, highly arcane class of sports statistics. It consists of a transmitter-about the size of a small pancake that fits snugly inside a regulation hockey or football helmet.”(16)

Operational Control- Structured

Examples of this type consist of the need for sports teams to schedule games for a season, referees or umpires for games, payroll operations, HR issues for employees and travel arrangements for teams.

Operational Control- Semi-structured

Examples would be to determine make-up days for games postponed for weather, replacement for players that are injured and placed on disabled lists. Also, replacements for ill umpires or referees fit into this cell.

Operational Control- Unstructured

Decisions in this category involve day-to-day choices involving prosecuting unruly fans at sporting events, repairing crashed team-web sites after diagnosing the problem, dealing with the arrest of a player and the action of damage control for the league, team and player (both on and off the field). Recall incidents of hockey fights (Bertuzzi), locker room incidents with the press, players getting involved in barroom brawls.

CONCLUSION

In this paper, we have used the nine-cell matrix as a basis for taxonomy of DSS as applied to decisions based in a professional sports context. This paper's contribution to the literature is the innovative application of the DSS framework to the professional sports environment. Academics will be able to explain and clarify DSS using the appeal of a sports perspective. It is clear that the framework of a DSS is just as appropriate to professional sports as it is to the business environment.

There are, however, some issues that raise serious questions when we view DSSs in professional sports. Some of these questions are as follows:

- (i) What is the real payoff of using a DSS for various decisions in professional sports? Rather than concentrating applications in mundane transactional activities, sports administrators should place more emphasis on data-driven CRM type activities so that they can better serve their customers via cross selling.
- (ii) How do we validate the value of DSSs in professional sports? Validation can be carried out at the model level as well as at the data level. Once data is collected, then analysis of patterns can begin. Traditional statistical methodologies can add value here.
- (iii) Are coaches and fans ready to accept and use computers in a real-time context on the sidelines or in the dugout? There have been several innovative general managers of some sports franchises that have drawn the attention of fans and analysts arising from their non-traditional roles of managing their business. Sports fans and team management have not been as proactive in real-time vs. pre or post game analysis. Perhaps, the advent of wireless technology will be the change agent in this regard.
- (iv) What is the impact on the spontaneity of decision-making?
- (v) What are the limits of using DSSs in professional sports? As in any typical business setting, the only limits of using DSS in professional sports will be set by the users themselves and their ability to be creative while at the same time being cost effective. It is not inconceivable that some day the winning manager might congratulate the IT analysts for giving them the winning edge along with the typical list of benefactors.
- (vi) Which sport(s) is the most advanced user of DSSs in professional sports? Our research did not identify any one sport as being universally more competent in applying DSS concepts than the others.

In summary, we return to the basic strengths/weaknesses of IS and computers. Computers are fast, accurate and can process vast amounts of data (all needed in professional sports situations). Computers cannot engage in original or creative thinking and follow precise instructions that are fed into them. Using these general observations, there is definitely an extensive array of opportunities to develop DSSs for professional sports. This paper presented a framework for classifying that potential.

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