

AC 2009-1843: SCORECARDS: TRACKING PROGRESS IN SENIOR DESIGN PROJECT COURSES

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Scorecards – Tracking Progress in Senior Design Project Courses

Abstract

Monitoring and evaluating the status of engineering design projects has traditionally been part art and part science. Weekly and monthly status reports, Gantt charts, design reviews, time logs, demonstrations, and presentations are often utilized to gain visibility of the progress on projects. Even with all these tools, it is often difficult to gain a clear, definitive view of the status of a given project.

In recent years, project dashboards and scorecards have been added to the list of tools employed in industry to give visibility of project status to all stakeholders. These tools seek to concisely display key metrics that give a clear view of project status.

In engineering project courses, students and faculty both are often challenged to assess the status and progress of the project. The traditional inputs of submitted homework, quizzes, and examinations are often not applicable. Assessment of progress tends to be more subjective, based on observations and conclusions drawn from reading status reports and team presentations.

This paper describes the development and application of project scorecards to traditional classroom senior design projects to help assess status and progress. During 2007-2008 academic year, a weekly scorecard was developed and utilized by 20 senior design project teams in Electrical and Computer Engineering. The tool was designed to aid both the design teams and the faculty in honestly and clearly assessing weekly progress on design projects. The results of the study are discussed including both the perceived benefits and drawbacks.

Introduction and Background

Dashboards and scorecards have been used in industry to aid in making the status of business and development projects more transparent and visible to upper management and clients. In 1992, Kaplan and Norton introduced the concept of a “Balanced Scorecard” as a management tool based partially on prior experiences at Analog Devices Corporation.³ The scorecard concept has also been applied in a variety of academic settings.^{1,2} The scorecard concept has recently been applied to the tracking of a distance-learning graduate program.⁶

Recently a scorecard has been developed to track student internship projects at Rose-Hulman Ventures⁵. The project work at the program is carried out on a contract basis for external clients by teams of students guided by a fulltime engineering project manager. The students are employed to work on the projects and receive pay but not academic credit for their involvement. The clients provide significant funding for the work and set high expectations for results. With 20 projects commonly active at one time, the scorecard provides quick overview of project status and problem areas.

The scorecard was developed using a Microsoft Excel spreadsheet incorporating conditional formatting of key metric cells. The conditional formatting was used to automatically highlight each metric cell in red, yellow, or green based on the value entered each week compared to

thresholds set in another region of the spreadsheet. The idea of the highlighting being that reviewers of the scorecard, including the project team itself, could quickly identify areas that needed immediate attention or additional diligence. By compiling weekly summaries of all project team's scorecards, the management team has been able to quickly identify trends across all projects. A user's guide was also compiled to guide users of the scorecard in communicating project progress to the team members, client, and managers at Rose-Hulman Ventures. The scorecard has been used with over 50 projects over the past three years in the Rose-Hulman Ventures program and has proven itself a valuable management tool in that environment.²

A Project Team Scorecard in the Classroom

In the fall of 2007, this concept was adopted for use at Rose-Hulman to track and help drive progress with classroom projects in the senior design sequence in Electrical and Computer Engineering (ECE). Traditionally, the student project teams in ECE have been required to submit weekly one-page project status memos to their faculty supervisor in addition to maintaining individual time logs. In addition, several times each quarter the teams have been required to complete peer reviews, make formal presentations on their progress to the group of faculty supervisors, and be available for informal "drop-ins" on team meetings by the group of faculty supervisors for demonstrations. The goals of introducing the scorecards were to both provide additional concise and standardized weekly metrics on the status of the project to each team's faculty supervisor and to also help the teams honestly self-evaluate their own progress.

Four sections of the senior design course, ECE460/461, spanning 80 students divided among 20 student project teams, guided by four ECE faculty members, utilized a modified version of the previous scorecard and user's guide. The teams updated the scorecards and submitted copies for review by each team's faculty supervisor every week for up to 25 weeks, starting early in the fall quarter 2007 and ending in the spring quarter of 2008.

The scorecard employed is shown on the left in Figure 1. The thresholds, embedded in the base spreadsheet and used to make decisions on the highlights to be applied to each cell, are in the table on the right of Figure 1. The threshold table is normally hidden and left fixed for all projects. Some cells require the entry of dates or other numerical data which is compared against the threshold table values to determine the highlight color. An example of this type of metric is very first row in Figure 1, "When was the last scheduled meeting with the client?". If less than 14 days ago then the cell is automatically highlighted in green, if more than 21 days the cell is highlighted in red, etc. Other cells provide drop down boxes for the user to select an appropriate value. An example of this type of metric is the fifth row in Figure 1 where the user chooses values for "How responsive is the client?" from a dropdown list of "Not", "Somewhat", "Very" stored in the threshold table. The cells are again automatically highlighted by the corresponding colors, red, yellow or green based on the selection.

Project Name	Date
Team 02 - SuperVista	9/15/2007

Client Communication Metrics

1. When was last scheduled team meeting with the client? (Date)	9/4/2007
2. When was the last written status report sent? (Date)	9/14/2007
3. When was the last email exchange with the client? (Date)	8/30/2007
4. When was the last phone contact with the client? (Date)	9/5/2007
5. How responsive is the client?	Somewhat

Supervisor Communications Metrics

1. When was last scheduled meeting with your faculty supervisor? (Date)	9/6/2007
2. When was the last project memo sent to your supervisor? (Date)	9/1/2007

Team Metrics

1. How is team morale?	Good
2. How many hours were put in last week by the team?	32
3. How many team members participated last week?	3
4. When was the last team planning meeting? (Date)	9/7/2007

Progress Metrics

1. Where is the project compared to the plan?	On Sched
2. How focused is the development effort?	Focused
3. How similar is the development effort to the original idea or goal?	Similar
4. How much technical risk is there?	High
5. When was the last client deliverable? (Date)	9/5/2007
6. When is the next client deliverable due? (Date)	10/20/2007

Performance Metrics

1. What is the level of client satisfaction?	Satisfied
2. Has a PDS been completed and approved?	In Progress
3. Has a project time line been developed and is it up to date?	In Progress
4. Has a training plan been developed and implemented?	In Progress
5. Has a budget been developed and agreed upon with the client?	No
6. What % of the project budget has been spent?	0

Red	Yellow	Green
21	14	
14	7	
14	7	
21	14	
Not	Somewhat	Very
21	14	
14	7	
Poor	Good	Excellent
0	32	40
2	3	4
14	7	
Behind	On Sched	Ahead
Scattered	Typical	Focused
Different	Similar	Same
High	Medium	Low
60	30	
30	60	
Unsatisfied	Satisfied	Ecstatic
No	In Progress	Yes
No	In Progress	Yes
No	In Progress	Yes
No	In Progress	Yes
90	50	

Figure 1 - Scorecard and Thresholds

Faculty project supervisors, who reviewed the scorecards weekly, optionally compiled composite running summaries for each team and also for all teams supervised. This is shown on the right in Figure 1. By looking across the rows, it is possible to see trends in each metric across all teams supervised or for each team individually. One can also quickly see dips or surges in performance week by week. Summaries compiled for each individual team were used for discussion with team leaders at bi-weekly meetings. Summaries for a given week were occasionally used to compare progress across all teams supervised. Examples of these types of summaries are shown in Figures 2 to 4 below.

	Team 16	Team 17	Team 18	Team 19
Week 02 Summary	9/23/2007	9/23/2007	9/24/2007	9/23/2007
Client Communication Metrics				
1. When was last scheduled team meeting with the client? (Date)	9/14/2007	9/6/2007	9/12/2007	9/12/2007
2. When was the last written status report sent? (Date)	9/12/2007	9/10/2007	9/17/2007	9/12/2007
3. When was the last email exchange with the client? (Date)	9/14/2007	9/10/2007	9/23/2007	9/13/2007
4. When was the last phone contact with the client? (Date)	9/14/2007	9/6/2007	9/12/2007	9/5/2007
5. How responsive is the client?	Very	Very	Somewhat	Not
Supervisor Communications Metrics				
1. When was last scheduled meeting with your faculty supervisor? (Date)	9/21/2007	9/19/2007	9/17/2007	9/10/2007
2. When was the last project memo sent to your supervisor? (Date)	9/17/2007	9/17/2007	9/24/2007	9/13/2007
Team Metrics				
1. How is team morale?	Excellent	Excellent	Good	Good
2. How many hours were put in last week by the team?	25	16	32	18
3. How many team members participated last week?	4	4	4	4
4. When was the last team planning meeting? (Date)	9/21/2007	9/19/2007	9/24/2007	9/17/2007
Progress Metrics				
1. Where is the project compared to the plan?	On Sched	Ahead	Behind	On Sched
2. How focused is the development effort?	Typical	Focused	Focused	Typical
3. How similar is the development effort to the original idea or goal?	Same	Same	Similar	Similar
4. How much technical risk is there?	Low	Low	Medium	Medium
5. When was the last client deliverable? (Date)	9/14/2007	n/a	9/12/2007	9/10/2007
6. When is the next client deliverable due? (Date)	9/28/2007	n/a	10/22/2007	9/28/2007
Performance Metrics				
1. What is the level of client satisfaction?	Ecstatic	Satisfied	Satisfied	Satisfied
2. Has a PDS been completed and approved?	Yes	In Progress	In Progress	In Progress
3. Has a project time line been developed and is it up to date?	In Progress	No	No	No
4. Has a training plan been developed and implemented?	Yes	No	No	No
5. Has a budget been developed and agreed upon with the client?	In Progress	No	In Progress	No
6. What % of the project budget has been spent?	0	0	0	0

Figure 2 - Team Comparison Summary

A Comparison of Two Teams

It is interesting to compare the scorecard summaries shown in Figures 3 and 4 for two different teams. The first team, team "X", was very successful in carrying out their project and ultimately received a high grade for their efforts. The second team, team "Y", struggled all year long, had difficulty getting started on their project, and ultimately received a significantly lower grade. Note that the summaries for both teams occasionally contain cells highlighted in red. The red color does not necessarily indicate a particular failure but indicates areas that needed attention by the team. For example, the row for "When is the next client deliverable due", was typically red throughout the project, reminding the teams that they had upcoming status reports due their client within the next 30 days.

	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09	Week 11	Week 12
Team X Summary by Week	9/12/2007	9/19/2007	9/26/2007	10/3/2007	10/15/2007	10/22/2007	10/29/2007	11/5/2007	11/26/2007	12/3/2007
Client Communication Metrics										
1. When was last scheduled team meeting with the client? (Date)	5/5/2007	5/5/2007	9/24/2007	9/24/2007	9/24/2007	9/24/2007	10/24/2007	10/24/2007	10/24/2007	10/24/2007
2. When was the last written status report sent? (Date)	9/9/2007	9/16/2007	9/24/2007	10/1/2007	10/8/2007	10/15/2007	10/24/2007	10/29/2007	11/5/2007	11/26/2007
3. When was the last email exchange with the client? (Date)	9/7/2007	9/17/2007	9/29/2007	10/1/2007	10/8/2007	10/15/2007	10/22/2007	10/29/2007	11/24/2007	11/26/2007
4. When was the last phone contact with the client? (Date)	9/9/2007	9/15/2007	9/24/2007	10/2/2007	10/2/2007	10/2/2007	10/2/2007	10/2/2007	11/24/2007	11/24/2007
5. How responsive is the client?	Very	Very	Very	Very	Somewhat	Somewhat	Somewhat	Very	Very	Very
Supervisor Communications Metrics										
1. When was last scheduled meeting with your faculty supervisor? (Date)	9/12/2007	9/19/2007	9/26/2007	10/1/2007	10/1/2007	10/18/2007	10/18/2007	11/1/2007	11/1/2007	11/28/2007
2. When was the last project memo sent to your supervisor? (Date)	9/10/2007	9/16/2007	9/24/2007	10/1/2007	10/8/2007	10/15/2007	10/22/2007	10/29/2007	11/5/2007	11/26/2007
Team Metrics										
1. How is team morale?	Excellent	Good	Excellent	Excellent	Good	Good	Good	Excellent	Excellent	Excellent
2. How many hours were put in last week by the team?	23	30	30	25	35	35	36	38	60	42
3. How many team members participated last week?	4	4	4	4	4	4	4	4	4	4
4. When was the last team planning meeting? (Date)	9/5/2007	9/19/2007	9/26/2007	10/3/2007	10/3/2007	10/17/2007	10/24/2007	10/24/2007	11/11/2007	11/28/2007
Progress Metrics										
1. Where is the project compared to the plan?	On Sched	On Sched	On Sched	On Sched	On Sched	On Sched	On Sched	On Sched	On Sched	On Sched
2. How focused is the development effort?	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Focused	Focused
3. How similar is the development effort to the original idea or goal?	Same	Same	Same	Same	Same	Same	Same	Same	Same	Same
4. How much technical risk is there?	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low
5. When was the last client deliverable? (Date)	9/12/2007	9/19/2007	9/24/2007	9/24/2007	10/8/2007	10/8/2007	10/8/2007	10/8/2007	11/13/2007	11/13/2007
6. When is the next client deliverable due? (Date)	9/19/2007	9/26/2007	10/1/2007	10/10/2007	10/22/2007	10/29/2007	10/29/2007	10/29/2007	12/3/2007	12/10/2007
Performance Metrics										
1. What is the level of client satisfaction?	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied
2. Has a PDS been completed and approved?	In Progress	In Progress	In Progress	In Progress	Yes	Yes	Yes	Yes	Yes	Yes
3. Has a project time line been developed and is it up to date?	In Progress	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Has a training plan been developed and implemented?	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
5. Has a budget been developed and agreed upon with the client?	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress
6. What % of the project budget has been spent?	0	0	0	0	0	0	0	0	10	10

Figure 3 – Weekly Summary for a Highly Successful Team (Team X)

	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09	Week 10/11	Week 12
Team Y Summary by Week	9/14/2007	9/21/2007	9/28/2007	10/5/2007	10/15/2007	10/19/2007	10/26/2007	11/5/2007	11/27/2007	12/3/2007
Client Communication Metrics										
1. When was last scheduled team meeting with the client? (Date)	9/5/2007	9/5/2007	9/26/2007	9/26/2007	9/26/2007	9/26/2007	9/26/2007	9/26/2007		9/26/2007
2. When was the last written status report sent? (Date)	9/10/2007	9/10/2007	9/24/2007	9/24/2007	9/24/2007	9/24/2007	9/24/2007	9/24/2007		12/3/2007
3. When was the last email exchange with the client? (Date)	9/14/2007	9/19/2007	9/28/2007	10/4/2007	10/11/2007	10/17/2007	10/26/2007	11/2/2007		12/3/2007
4. When was the last phone contact with the client? (Date)	9/11/2007	9/11/2007	9/26/2007	10/5/2007	10/15/2007	10/15/2007	10/15/2007	10/15/2007		11/1/2007
5. How responsive is the client?	Somewhat	Somewhat	Very	Very	Very	Very	Somewhat	Somewhat		Somewhat
Supervisor Communications Metrics										
1. When was last scheduled meeting with your faculty supervisor? (Date)	9/14/2007	9/21/2007	9/28/2007	9/28/2007	10/8/2007	10/8/2007	10/18/2007	11/1/2007		11/1/2007
2. When was the last project memo sent to your supervisor? (Date)	9/10/2007	9/17/2007	9/24/2007	9/24/2007	10/8/2007	10/8/2007	10/8/2007	10/8/2007		11/4/2007
Team Metrics										
1. How is team morale?	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good	Excellent		Excellent
2. How many hours were put in last week by the team?	0	15	25	25	35	35	37	46		35
3. How many team members participated last week?	4	4	4	4	4	4	4	4		4
4. When was the last team planning meeting? (Date)	9/14/2007	9/21/2007	9/28/2007	10/5/2007	10/15/2007	10/19/2007	10/26/2007	11/2/2007		11/29/2007
Progress Metrics										
1. Where is the project compared to the plan?	On Sched	On Sched	On Sched	On Sched	Behind	Behind	Behind	On Sched		On Sched
2. How focused is the development effort?	Scattered	Scattered	Typical	Typical	Scattered	Scattered	Typical	Focused		Focused
3. How similar is the development effort to the original idea or goal?	Different	Different	Similar	Similar	Different	Similar	Similar	Similar		Similar
4. How much technical risk is there?	High	High	High	High	High	Medium	Medium	Medium		Medium
5. When was the last client deliverable? (Date)	9/7/2007	9/7/2007	9/28/2007	9/28/2007	9/7/2007	9/7/2007	9/7/2007	9/7/2007		11/4/2007
6. When is the next client deliverable due? (Date)	9/28/2007	9/28/2007	10/10/2007	10/10/2007	11/6/2007	11/6/2007	11/6/2007	11/6/2007		1/21/2008
Performance Metrics										
1. What is the level of client satisfaction?	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied	Satisfied		Satisfied
2. Has a PDS been completed and approved?	In Progress	In Progress	In Progress	Yes	Yes	Yes	Yes	Yes		Yes
3. Has a project time line been developed and is it up to date?	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress		In Progress
4. Has a training plan been developed and implemented?	No	No	No	Yes	Yes	Yes	Yes	Yes		Yes
5. Has a budget been developed and agreed upon with the client?	No	No	No	No	In Progress	In Progress	In Progress	In Progress		Yes
6. What % of the project budget has been spent?	0	0	0	0	0	0	0	0		90

Figure 4 – Weekly Summary for a Struggling Team (Team Y)

The difficulty that team “Y” was experiencing in getting started with their project shows in the Progress Metrics section for the first two weeks by two almost entirely red columns. Note also that team “Y” fails to meet with or send a written status report to their client for several successive weeks, weeks 7-12, another indication of their struggle. In comparison, team “X” never goes more than two weeks without meeting with their client, and has Progress Metrics that are generally green or yellow throughout the course.

It is also telling that team “X” is diligent enough to submit a status report for week 11, which was actually a quarter break, when most students are gone from campus, whereas team “Y” chooses to skip evaluating their progress that week altogether. From a diagnostic perspective, the scorecard results give indications as early as week 3 or 4 of the term that team “Y” is having difficulties with time left in the term for either students or faculty to take corrective action.

Metric Selection

As previously indicated, the scorecard utilized in the ECE460/461 course during 2007/2008 was based on an existing scorecard already in use at Rose-Hulman Ventures. In a commercial setting, project management will typically focus less on ‘activity’ and more on such metrics as schedule and cost. In academic projects, the general categories of communication, team, progress, and performance have been identified as appropriate. In particular, communication with the project client and faculty supervisor, and team dynamics have proven to be valuable tracking metrics. Several of these individual metrics are direct carryovers from the earlier scorecard.⁴ Metrics such as the ones for client communications and the metric for the level of client satisfaction were direct carryovers.

Other metrics have been added based on prior experience with teaching the course. The students are told that they are expected to each devote 10 hours or more per week to the project and traditionally been asked to maintain time logs, on an individual basis. A scorecard metric was added to reinforce this expectation by monitoring the total team hours invested each week. While ‘hours spent’ on the project is a measure of ‘activity’, it is hoped that this correlates to team engagement and progress.

Additional metrics were added to help monitor team performance against traditional deliverables and milestones for the course. These included several of the metrics in the previous section labeled ‘Performance Metrics’. The teams are required to develop a detailed product design specification (PDS), a training plan detailing what skills and knowledge they need to acquire to carry out the project, and a budget covering anticipated expenses. The teams are required to obtain client sign-off on the PDS and any modifications to it, along with client approval for the budget. Specific metrics were added to the scorecard to monitor and encourage progress in achieving these key milestones.

Perceived Benefits and Drawbacks

The four faculty members who utilized the scorecard generally concluded that there were both clear benefits and drawbacks to the using scorecard in the senior design course. Some of the perceived drawbacks might be addressed in the future by making minor changes to the design of the scorecard, better choice of metrics, and better preparation of the students to utilize the scorecard effectively.

The perceived benefits included providing weekly reminders to the project teams of key milestones and expectations. The student project teams are expected to show initiative in staying on schedule, keeping their faculty supervisor and external client informed of their progress and meeting key course milestones. The scorecard provides a tool that the teams were able to use to self assess their progress in meeting the key milestones and expectations for the course and to see clearly and quickly when they were falling behind schedule.

The scorecard provided a means for the faculty supervisors to identify problems developing within a given team and discuss them with the team leaders. By compiling a composite week by week summary for each team, the faculty supervisor can easily spot problems developing in a given team. A growing red row for a particular metric provides a clear signal that a team is having a difficulty in meeting the given course metric.

By compiling a summary of weekly scorecard across all teams supervised, the faculty member can see trends developing course wide and areas where all teams are encountering difficulties. These can be addressed at an upcoming class meeting if necessary.

One of the perceived drawbacks to the use of the scorecard included the additional paperwork load imposed on each team to fill out the scorecard weekly. The student project teams have many requirements to meet with limited time available. They were already busy working to not only complete technical design engineering work but also meet other course requirements for reporting, including periodic preparation of formal presentations and detailed written status reports.

Too often, the scorecards were filled out at the last minute by only the team leader with little team involvement. This contributed to a lack of student commitment to using the scorecards. This might be addressed by devoting more time at the start of the course to discussing using the scorecard as a management tool for self-assessment of each team's progress.

Another perceived drawback was that some of the metrics did not work well because the teams really lacked experience in judging their status. For example, many teams would indicate that they were "on-schedule" but they were actually behind schedule but overly optimistic due to inexperience. Other teams might under or over-estimate the technical risk associated with their project on the scorecard.

Inappropriate metrics and thresholds were another problem area. As discussed earlier, some of the metrics were direct carryovers from a version of the scorecard previously used for managing commercial projects executed under contract. Some of these may not have been the best fit for student projects being carried out as part of a classroom exercise. For example, the threshold set for highlighting the cell in red when the next client deliverable was due, might have been set for a shorter period for classroom projects given the shorter term of the classroom projects.

One set of thresholds may not be appropriate for all teams. Some clients may not want to be in contact with the student teams as often as they might for an industrial project. Some teams felt that they should contact the client more often, prompted by a red scorecard cell, only to find out the client really was not that interested or able to devote the extra time.

Another outcome was that the teams tended to focus on only what was measured. This can be both a benefit and drawback. If an ideal set of metrics have been selected, the scorecard will tend to drive the teams toward the desired course goals and objectives. Care must be exercised in selecting metrics that align with the overall course goals and do not focus student attention on less important objectives.

Future Plans

In the fall of 2008, the decision was made to incorporate a short “Dashboard” table at the top of the weekly memo to monitor a few key metrics instead of utilizing a separate scorecard. This requires less paper work preparation by each project team while retaining some of the benefits from the scorecard. One drawback is the loss of conditional formatting to highlight cells based on threshold values. One benefit is that items flagged in the dashboard can be followed up in more detail in the report immediately below. Another benefit was that each team member was required to post individual hours contributed to the project each week not just a total for the team. This has lead to more individual attention to the values posted on the dashboard and less reliance on just the team leader to be the only one responsible for compiling the metrics. The end result has been much more accurate reporting with less ‘guessing’ by the team leader and a clearer conveyance of expectations.

Additional future possibilities or improvements include:

- to look for ways to embed a spreadsheet in the word processor based weekly memo to again be able to automatically highlight cells in different colors based on threshold but still only have one weekly document to be submitted. There are currently discussions to review the metrics and thresholds used in the scorecard, and perhaps employ the scorecard again in the fall of 2009.
- to require the teams assigned to each faculty member to meet weekly as a group with the faculty member where they would report to the group on their team’s progress by sharing their team’s scorecard with the other teams present. This would encourage the teams to use the scorecard as a communication and management tool. This would also mimic the reporting structure the engineering students are likely to encounter after graduation when required to give ad-hoc project status reports at departmental meetings in the presence of their peers.
- to poll the students each quarter for their assessment of the utility of the scorecard and suggestions for better metrics and thresholds. By giving the student more control over the design of the scorecard, they will gain more insight into how it may be employed as a management tool and hopefully have more commitment to its use. Ideas for improved metrics could be collected and discussed at the start of each quarter by the entire class of students and the scorecard continuously improved.

Conclusions

1. Scorecards represent a new and unique tool that may be utilized to monitor and direct student projects.
2. They provide concise clear views of key metrics associated with project execution.
3. They help drive progress toward chosen milestones and encourage chosen behaviors.

4. The scorecards provide 'early warning' of projects in trouble allowing students and faculty time to take corrective action.
5. Care must be taken in selecting the metrics as the student teams will tend to focus on those activities and may neglect others.
6. The number of metrics monitored must be kept manageable to encourage use.
7. Successful implementation requires buy-in by all the members of each project team and considerable planning in advance.

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