

# A Balanced Scorecard for a Small Software Group

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**Y**ou can't make money selling software. At least, that's what many firms that view software as an ancillary component to their business think. Semiconductor manufacturers and other electronic equipment manufacturers typically need to supply drivers and applications to let customers use their components. However, such firms often overlook the value of these software components and, consequently, miss a considerable revenue opportunity.

The problem partly lies with perception: "Are we a semiconductor firm or a software firm?" An even greater part of the problem is educating management, marketing, and finance about the software's potential for revenue. To address this, we need a financial modeling tool that not only captures past results, but also provides a forward-looking view. A typical quarterly profit and loss statement gives a historical perspective of a firm's operations, but it doesn't give management and staff a roadmap. Nor does it let you link specific actions with desired outcomes.

Over the last 11 years, the Balanced Scorecard (BSC) has developed as a way to execute strategic plans and continuously monitor strategic performance. This article presents basic information on BSC methodology as well as critical success factors and common pitfalls.

## The Balanced Scorecard

Good managers understand that performance metrics identify what actions to take. Effective performance metrics must accurately

reflect a business situation, guide employees to take the right actions, and gauge those actions' effectiveness. However, in today's fast-changing economies, organizations need more than traditional performance metrics. They need metrics linked to strategic objectives that will promote positive future results and accurately capture past performance.

The BSC can help your firm select performance metrics that will drive organizational strategy. Furthermore, the BSC is a method to communicate strategies. A BSC can be defined as

*a system of linked objectives, measures, targets and initiatives which collectively describe the strategy of an organization and how the strategy can be achieved. It can take something as complicated and frequently nebulous as strategy and translate it into something that is specific and can be understood.<sup>1</sup>*

Many organizations have successfully implemented a BSC and realized remarkable improvements in their financial performance—becoming, in some cases, leaders in their industries.

The Balanced Scorecard is an effective and comprehensive methodology that can help organizations link their performance metrics to strategic objectives. The example matrix and strategy map focus on small development organizations.

**Table 1****The four perspectives of the Balanced Scorecard**

Perspective	Key question
Financial	To succeed financially, how should we appear to our stakeholders?
Customer	To achieve our vision, how should we appear to our customers?
Operational	To satisfy our customers and shareholders, at what business processes must we excel?
Learning and growth	To achieve our vision, how will we sustain our ability to change and improve?

**History**

The BSC was devised in the early 1990s by Robert Kaplan of the Harvard Business School and David Norton as a method to help companies manage their increasingly complex and multifaceted business environments.<sup>1</sup> This grew out of earlier efforts by Kaplan and Norton to shape the concept in the late 1980s. They saw the limitations of relying on purely financial measures, in particular, short-term financial goals. Companies might appear to be doing poorly in terms of short-term financial metrics because they were investing in core capabilities to drive superior future performance. Lagging indicators conveyed past performance but did not provide a good indication of future performance. Employees often did not understand how their jobs related to the firm's strategy.

**Perspectives**

The classic BSC has four *perspectives* (listed in Table 1). You can explain each perspective by an associated key question. The answers to the key question become a perspective's *objectives*. You can then measure performance against the objectives. The perspectives and key questions in Table 1 reflect possible organizational strategies, out of many, and should be adapted to capture the firm's key strategies.

**Objectives and measures**

Metrics measure objectives, or desired outcomes. Metrics are quantifiable performance statements that indicate how an initiative is performing relative to its objectives. Metrics must be

- Relevant to the strategy
- Stated in the context of a goal to achieve in a defined time
- Capable of being tracked and owned by a person or group with the power to influence the outcome

A key tenet of the BSC is to balance *lagging* indicators with *leading* indicators. Lagging indicators tell us what has happened. In contrast, leading indicators attempt to quantify future results based on current actions. It is also important to balance internally focused metrics, such as cost reduction and productivity, with externally focused metrics such as market share and customer satisfaction.

**Tools**

Even a simple scorecard can contain an overwhelming amount of information. *Strategy maps* and a *strategy matrix* can help communicate large, complex quantities of information in simple, easily understood ways.<sup>2</sup>

Mapping a strategy lets you show visually an organization's perspectives, objectives, and metrics and helps reveal the links between each factor in the BSC. Creating a map can ensure all elements are consistent and comprehensive in defining and executing the strategy. Maps also let you communicate across organizational boundaries.

The strategy matrix is another useful visualization and summarization tool. It displays objectives, metrics, targets, and initiatives in one table. Typically, each strategic theme has its own strategy.

**The BSC at work**

I lead a 25-person software development department, which developed the BSC described in this article. The group is part of a larger organization that designs and manufactures communications semiconductors.

Management views the software group's primary role as providing applications and tools to customers. Secondary roles include providing software tools to other engineering groups in the company, helping customers use the group's software, and providing software engineering design assistance to customers.

Overall, management considers the group's software products as secondary to the firm's primary product—semiconductor chip sets—and views the software department as a cost center.

Additionally, the firm's culture sees the software group as support for marketing and engineering, in producing the sample software. Because the customer's final prod-

**Table 2**

**The software development Balanced Scorecard strategic matrix,  
with the theme of “timely, targeted software support”**

	Objective	Metric	Target: Date	Initiatives
<b>Financial</b>	Department should be self-sustaining	Total software revenue $\geq 2 \times$ (total Full-Time Equivalent <sup>1</sup> Employee salary + benefits costs)	25%: year 1 100%: year 4	<ul style="list-style-type: none"> <li>■ Provide marketing with benefits analysis of product and support</li> <li>■ Monthly review of sales with marketing</li> </ul>
<b>Customer</b>	Deliver complete solutions	Number of customer requests for new or missing features	<25 per release: year 1 <10 per release: year 2	<ul style="list-style-type: none"> <li>■ Review and analysis of requirements with marketing</li> </ul>
	Deliver timely solutions	Release date to marketing	$\pm 1$ week of plan: year 1 $\pm 1/2$ week of plan: year 2	<ul style="list-style-type: none"> <li>■ Review and analysis of requirements with marketing</li> <li>■ Schedule creation and review with marketing</li> </ul>
	Deliver timely support	Days to answer customer inquiries to customer's satisfaction	1–3 < 1 day 1–3 < 3 days 1–3 < 2 weeks	<ul style="list-style-type: none"> <li>■ Review and analysis of issues with marketing</li> <li>■ Team defect analysis</li> </ul>
<b>Operational</b>	Increase quality of delivered software and support	Number of customer requests for bug fixes	<25 per release: year 1 <10 per release: year 2	<ul style="list-style-type: none"> <li>■ Design review process</li> <li>■ Code review process</li> </ul>
	Streamline development process	Reduce average time for defect repair	25%: year 1 50%: year 2	<ul style="list-style-type: none"> <li>■ Team defect analysis</li> </ul>
		Reduce defect density	25%: year 1 50%: year 2	<ul style="list-style-type: none"> <li>■ Design review process</li> <li>■ Code review process</li> </ul>
<b>Learning and growth</b>	Increase C programming language knowledge	Code review defects found	>90%: year 1 >99%: year 2	<ul style="list-style-type: none"> <li>■ In-house system training in C</li> <li>■ Code review process</li> </ul>
	Increase software process knowledge	Number of engineers using the Software Engineering Institute Personal Software Process	25%: year 1 50%: year 2 100%: year 3	<ul style="list-style-type: none"> <li>■ PSP training</li> </ul>
	Educate sales and marketing on our software's value	Number of sales agreements showing separate software revenue line items	25%: year 1 100%: year 4	<ul style="list-style-type: none"> <li>■ Training of sales and marketing personnel on the benefits provided by our software</li> </ul>

uct does not use this software (at least not without modification and customer testing), the software's quality is secondary to the speed at which it is produced.

For years, the company had developed integrated circuits of increasing sophistication, and over time, the ICs became too complicated to operate without significant training and support. Accordingly, the firm progressed from delivering very simple software that showed customers how they might use the firm's semiconductors, to software that permitted customers to produce designs quickly, to software that customers had to have to use the firm's ICs.

However, the company, following the modus operandi established with the first generation of ICs, continued to give the software away, even though

of the benefits of doing so by running different software on the IC.

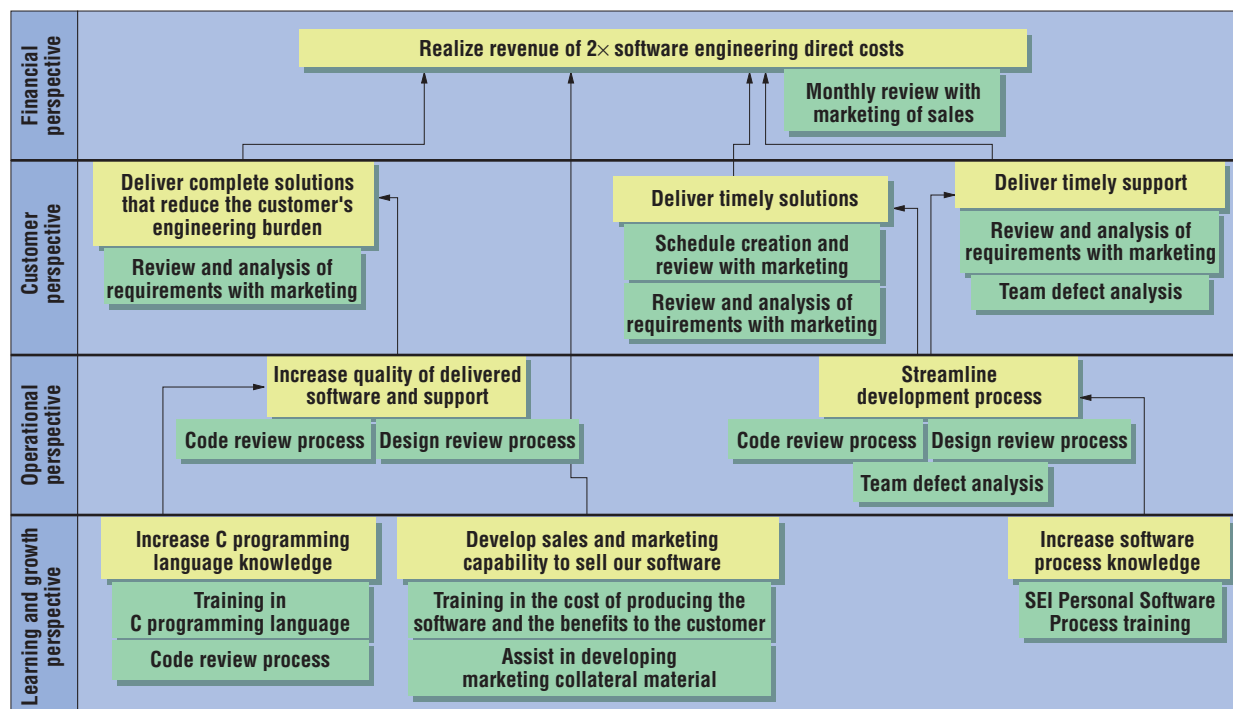
- The software reduced customers' time to market.
- Producing tools for debugging, calibration, and manufacturing tests became nontrivial endeavors. Customers would have difficulty creating these tools without a significant investment in engineering resources.

The software team and some marketing managers believed that the company was missing a considerable revenue opportunity—that it should charge for its software as a separate line item. By doing so, it could account for and realize the revenue associated with software output and move toward becoming a profitable software organization.

#### Developing the BSC

Table 2 shows the BSC the software team developed, with the strategic theme of “timely, targeted software support.” We aimed to increase our capabilities to deliver

- The software gave the IC new flexibility that the customer could leverage to differentiate their products. So, a small company that could never afford to produce a custom IC could still derive many



**Figure 1. Software development Balanced Scorecard strategy map.**

customer satisfaction in a timely manner. Additionally, we would work with marketing to develop plans to target profitable customers with weak software capabilities.

We considered the four classic BSC perspectives (see Table 1). Each perspective has an associated objective, metrics, targets, and initiatives. Most have more than one objective, and most objectives have more than one metric, target, and initiative associated with them.

To better illustrate the relationships between the perspectives, Figure 1 shows a strategy map. The map gives a visual indication of the interdependencies of each objective and the supporting initiatives.

The various metrics we used in our BSC are available either directly or by statistical inference from existing department processes and tools. This mitigated a major problem of general BSC implementation in that we didn't need to develop new technologies or tools. For example, data for the financial perspective comes from the marketing department's detailed monthly sales reports.

#### The group's mission

With this BSC, the group aimed to demonstrate to the company that we could successfully and profitably market our software. This would require a cultural and strategic change. Additionally, we understood that operational items such as pricing structures,

marketing material, order fulfillment, and sales objectives would need modification.

This was the firm's first exploration of this topic and the first time it was using the BSC in planning and executing a strategy. We agreed that this first step must be quickly viewed as successful; the relationship between the group's methods and its progress should manifest within one year. A typical BSC program plans for initial results in 24 to 36 months. With our compressed schedule, we decided that the initiatives driving each objective should remain, as much as possible, under our direct control.

As with most change initiatives, our efforts returned a wide spectrum of responses. The least resistance came from management; we were providing them a roadmap that promised more revenue. The greatest resistance came from sales and marketing. We were asking them to earn revenue on what had previously been given for free to customers. They worried that they would lose sales if customers resisted moving from free to fee software.

#### The financial perspective

After reviewing our original BSC with marketing, we restated our goal to make it easier for the firm to understand and more gratifying for the software group—that is, instead of going for a break-even scenario, we would target becoming a profit center in

four years. With this, we established our financial objective.

We assumed that the software revenue was being recorded and knew that awareness needed to be raised in the firm. We planned to spend more time with sales and marketing to clarify the value of the software and support, and how the customer benefited. We hoped sales and marketing might then see the software as a separate product, not merely an adjunct to the ICs. Additionally, we set monthly meetings with sales and marketing to review the month's activity and to identify which customers might benefit the most from our software.

### The customer

For this perspective, we concentrated on improving what we were doing right. Customers reported that they valued both how we delivered robust solutions in a timely manner and our very good turnaround time for support issues.

To continue delivering these objectives, we set initiatives to increase our dialog with marketing. We reasoned that this would help us better understand the issues customers were facing—their schedules and competitors' feature sets. We targeted reducing the number of postrelease feature requests. We believed this would let us reasonably judge our solution's completeness. Furthermore, we established metrics for on-time delivery to marketing.

Our final objective for this perspective was to improve the response time to customer support issues. We measured this in the number of days it took to successfully resolve the customer's issue. To reach this objective, we aimed to review problems with marketing rather than just taking written issue reports. Additionally, we assigned each issue to a software review team, for *team defect analysis*, instead of a single engineer.

### Operational

This perspective called for increasing software quality while streamlining the development process. Most of the team felt we had good design and code review processes but that they required too many people (8 to 10) to execute. We believed we could obtain most of the reviews' benefits with smaller teams (3 to 5). Smaller teams could deliver virtually the same quality in a much shorter time.

To further support this goal, we reused team defect analysis to facilitate defect identification. We believed this would reduce repair time and increase overall quality by ensuring repair of the defect's root cause.

### Learning and growth

Ironically, we had the most controversy when we came to this perspective. Some team members wanted to use quantitative metrics as described in the literature.<sup>3-5</sup> Others wanted to concentrate on taking a more customized approach regardless of whether we had preexisting research behind the metric. We finally decided to use metrics that were easiest to gather and, of course, made sense for the desired objective.

We also considered the challenges posed by the other perspectives. For example, our customers preferred C to other programming languages, so we needed a strong competency in it. We determined that staff had varying levels of experience, which had resulted in coding styles that fell below our standards and coding practices that interfered with timely maintenance. We decided to hold an internally led training session to collaborate and equalize the staff's knowledge.

We addressed poorly executed code and design reviews by holding a series of weekly sessions to analyze our processes and create a consensus solution on review procedures.

For our final technical initiative, we believed that supporting engineers in pursuing training in the Software Engineering Institute's Personal Software Process would return value to the firm by increasing productivity and engineer retention.

The technical initiatives aside, the software group's most critical initiative was to start a series of training classes with help from several marketing personnel. Together, we demonstrated what each software component did and described the work it eliminated for the customer. With the assumption that our in-depth knowledge of the ICs would let us produce software for less than the customer could, it followed that we could easily translate our financial investment in the software into customer savings. By understanding this benefit, sales and marketing were able to establish a pricing schedule and a marketing plan with collateral material (data sheets, product notes, and so on) to start realizing this new source of revenue.

**We decided to use metrics that were easiest to gather and, of course, made sense for the desired objective.**



**We worked with sales and marketing to create objectives, metrics, targets, and initiatives that they felt were important for reaching the goal.**

### Metrics and targets

For each objective, we established metrics and associated targets that we believed were visible to the firm and easy to gather from existing systems.

As mentioned earlier, our BSC effort met with a wide spectrum of responses. The metrics and targets shown are not the first that we formulated. Because we determined that key resistance would come from sales and marketing and because we felt that our engineering outlook could bias the elements, we enlisted help from sales and marketing to add crossfunctional ideas. We worked with them to create objectives, metrics, targets, and initiatives that they felt were important for reaching the goal. By creating the BSC in an iterative, collaborative manner with them, we made it easier to gain their sustained support.

### Critical factors

Organizations successfully use BSCs to create a culture of continual focus on strategy formulation, measurement, and revision—what Kaplan and Norton call a “strategy-focused organization.”<sup>1</sup>

These are key elements for creating a strategy-focused organization:

- *Mobilize change through executive leadership.* Building a strategy-focused organization involves significant cultural changes. Organizational change is an evolutionary process.<sup>6,7</sup> Executive commitment is critical to maintaining such a program’s momentum.
- *Make strategy a continual process.* A strategic plan cannot succeed if strategic planning is a one-time activity. You need feedback loops to constantly focus attention on and reevaluate strategy and metrics.
- *Align the organization to the strategy.* This requires reviewing current organizational structures, policies, and procedures to ensure consistency with the strategic plan. It might also require reorganization or redefining roles.
- *Make strategy everyone’s job.* You can accomplish this through training and awareness and by deploying the scorecard down through the organization. You must explicitly explain each group’s connection to the strategic plan. Depart-

ments and individuals must align their actions to support the strategy.

- *Link strategy to operational tasks.* Use tools such as strategy maps and matrix scorecards to link and align strategy with the operational tasks that employees perform.

### Common pitfalls

Most organizations that adopt a scorecard fail to reap the rewards they expect, and some common themes stand out:

- *Failure to communicate and train.* A scorecard will work only if an organization clearly understands and supports it. Without effective communication throughout the organization, a Balanced Scorecard will not spur lasting change and performance improvement.
- *No accountability.* Accountability and high visibility help drive change. This means that each metric, objective, and initiative must have an owner. A perfectly constructed scorecard will fail if no one is held accountable for performance.
- *Measures that do not focus on strategy.* A common problem is that an organization will adopt new nonfinancial measures but fail to align the measures adequately with strategy. According to Norton, “The biggest mistake that organizations make is thinking that the scorecard is just about measures. Quite often, they will develop a list of financial and nonfinancial measures and believe they have a scorecard. This, I believe, is dangerous.”<sup>1</sup>
- *Measures tied to compensation too soon.* In most cases, compensation should be linked to the BSC. However, it can be a mistake to do that too soon in the scorecard’s life cycle. Most BSCs are revised several times during their lifetimes. You must take care to ensure that compensation linkages change as the BSC changes.
- *Employees not empowered.* Although accountability can provide strong motivation for improving performance, employees must also have the authority, responsibility, and resources to effect change. Otherwise, they will not remain committed to the strategic plan’s success. You must also provide resources, and fund initiatives, to achieve success.

- *Too many initiatives.* When driving a cultural change initiative such as the BSC, you should ensure that each goal is important. Stress alone, created by cultural changes, can itself cause the plan to fail. This problem only intensifies if the BSC contains trivial items, or items that lack consensus among the management team.

**I**t's too soon to determine if we've achieved our overall goal. That will take several more years. However, we've observed progress in the desired direction on all initiatives. Monitoring and reporting progress (and problems) has been important in creating continuing support from various levels of the organization. We found it helpful to bring people from outside the team to review our BSC with an independent and critical eye. Like any change initiative, our BSC eventually became the team's status quo. Additionally, we learned that the BSC must be a dynamic document. As internal and external conditions change, you must review your goals, initiatives, metrics, and objectives and should involve as many of the affected groups as possible. Creating a BSC is a work of self-discovery, as it forces you to define its role and contributions to the organization. No set formula exists to create a BSC's various elements. You should tailor these for the greatest im-

## About the Author



**Steven Mair** has more than 18 years' experience in developing embedded and other software systems and managing software organizations, most recently as Director of Software Engineering at Magis Networks and Division Director of Software Engineering at Conexant Systems. His research interests include software operational management and organizational behavior. He received a BSEE from California State University, Northridge, and a master's degree in business administration from the University of Maryland. He is a member of the Software Engineering Institute, ACM, IEEE, Project Management Institute, and American Society for Quality. Contact him at [stevenmair@ieee.org](mailto:stevenmair@ieee.org).

pact with the lowest burden on your organization. Finally, we learned that you can use the BSC to successfully communicate your goals and methods to people with diverse backgrounds and achieve a desired organizational change. ☞

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