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在初始设备制造商(OEM)同电子制造服务供应商(EMS)之间的关系上，有很多浪费金钱的漏洞。本文对OEM/EMS关系中双方不太明显的浪费金钱的漏洞给予说明。这些漏洞起因于业务过程、制造、工程和质量方面。OEM和/EMS的管理部门都对不发展其同OEM/EMS关系而损失无关的金钱损失负有责任。本文说明一种工具，可确定OEM/EMS计划的真正费用的一种工具，这种工具分析质量差造成的成本和基于活动的费用。

Covert Money Losses in Outsourcing

Edwin B. Smith, III

Understanding the less obvious sources of wasted money in OEM/EMS manufacturing relationships.

There are many sources of wasted money in original equipment manufacturer (OEM)/electronics manufacturing services (EMS) provider relationships. This article will explore the less obvious sources of wasted money for both parties. These sources encompass every aspect of the relationship and arise from business processes, manufacturing, engineering and quality.

Success Factors vs. Management Philosophies

Before moving to sources of lost money in programs, let us quickly review factors that allow program success. The Standish Group International has conducted and published extensive research on the success and failure of software development and application projects. In 1995, this research company performed a comparison of successful and unsuccessful projects. Success was defined as *a product that met documented user requirements and was delivered to an established on-time criteria.*

Using these measures, the group created a success potential chart that identifies key factors associated with project success. The success criteria were weighted based on the input from the survey participants (Table 1). The most important criterion—user involvement—was given 19 success points, while the least important—hard-working, focused staff—was given three success points.

The results of this research are opposed to the usual manufacturing management paradigm that rewards those members of the program team who work 100 hours per week, while maintaining some level of secrecy surrounding the manufacturing process. For example, many EMS providers continue to resist the free flow of information with the OEM. Likewise, OEMs are reluctant to allow the EMS provider a view into their design processes.

In addition to rewarding behaviors that do not contribute to program success, companies place emphasis and rewards in areas that yield little value, at the expense of areas that could yield great value. One such improvement area is working to integrate an EMS provider further with its OEM customers. Instead, how many program managers know their OEM customers' mission statement, vision statement and three top strategy goals? How many factory managers know these items? When the OEM CEO has an all-hands meeting, does the OEM point of contact give a summary to the EMS provider?

In further support of this point, tools and processes are not selected by either EMS compa-

Success Criteria	Points
1. User involvement	19
2. Executive management support	16
3. Clear statement of requirements	15
4. Proper planning	11
5. Realistic expectations	10
6. Smaller project milestones	9
7. Competent staff	8
8. Project team ownership	6
9. Clear vision and objectives	3
10. Hard-working, focused staff	3

TABLE 1: Success factors for projects (The Standish Group, 1995).

nies or OEMs with the primary thought of giving the next customer an advantage. Instead, tools and systems are selected because they provide nice management reports, solid financial report closing or some political tool.

When EMS management believes that it does not have tight enough controls, usually financially speaking, over a process, it adds steps and approvals to it. Often, in this process, the customers' business models and how these added process steps will affect them are not considered. Of course, though, EMS management has to actually *know* its customer's business model to provide processes that are more effective to the customer.

Without knowledge of both parties' goals, profit-making opportunities within their business model, and strategy, the EMS/OEM relationship will never reach its potential. By not reaching its potential, the relationship becomes a covert money waster.

Loss: Designed In or Built In?

Money is lost when program managers and technical staff fail to keep advised of best practices in other industries and fail to implement those systems that would improve material velocity, asset management and customer satisfaction. For example, the EMS provider and the OEM should review pertinent ISO, ASTM and ANSI literature. Many items highlighted in this literature will help with all aspects of improving service to the end customer—from fundamental communications standards to end item packaging testing.

Quality management systems such as QS-9000 have many requirements that may appear burdensome on the surface but are extremely helpful to improving both the OEM and EMS operations. Most salient of these is the requirement to monitor both incoming and outgoing premium freight.

Premium freight use is a powerful indicator of the health of business processes at both OEMs and EMS providers. If incoming premium freight is costly, then one should ask why procurement activities are not smooth enough to allow less costly transport choices. Are buyers simply choosing to use premium freight carriers as a crutch? When outgoing premium freight charges are excessive, why does on-time delivery depend on the freight carrier, not on smooth shop floor planning and execution?

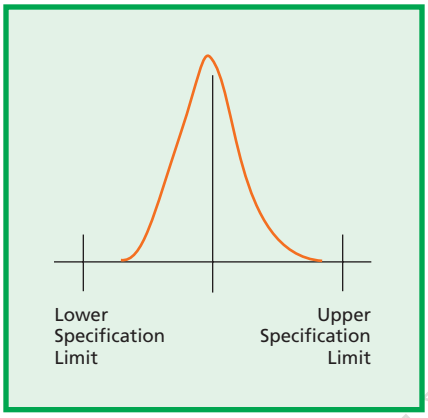

FIGURE 1: Good process capability.

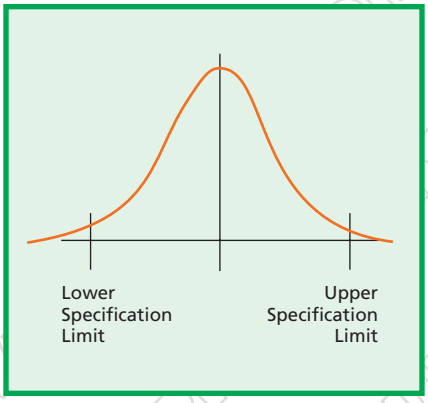

FIGURE 2: Poor process capability.

Many criticisms are leveled at the ISO series of quality management standards, and some of this disapproval has merit. However, many more opportunities exist to improve customer satisfaction, eliminate waste and thus improve the profitability of any OEM/EMS relationship if the appropriate standards are selected and their requirements followed.

When technical problems arise, the team often seeks a highly technical and perhaps expensive solution but neglects simpler, low-cost/no-cost solutions. An example is the lack of mistake-proofing programs at EMS factories and in OEM design plans. A mistake-proofing device is any mechanism that either prevents a mistake from being made or makes the mistake obvious at a glance. These devices are used to prevent the special causes that result in defects and to inexpensively inspect each item that is produced to determine whether it is acceptable or defective. This inspection is performed by the operator performing the assembly step and preferably becomes transparent to that operator. The operation cannot be performed to completion unless the correct condition is satisfied.

Not quantifying and then attempting to improve process capability is another source of lost money. Capability is usually expressed as an index, with greater numbers showing that the process has greater statistical margin to maintain itself in a certain tolerance band. Stated simply, capability is a measure of how the process tends to produce items within the allowed specification tolerances. Most processes with numerically measurable outputs, such as solder paste print volume, produce these outputs according to a normal bell curve. Processes that have a slender bell curve, which falls well within the upper and lower specification limits, have good process capability (Figure 1). Processes that show portions of their normal curve falling outside of the specification limits have poor process capability (Figure 2).

Several quality and operations researchers have determined that, as process capability decreases, costs of operating the process increase exponentially (Kotz and Johnson, 2002). Juran (1989) offers a model for cost of poor quality (COPQ) and reasons why it tends to be 30% or more of total costs in manufacturing firms.

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Process capability has both the actual process outputs and the design specification width in its calculation. Process capability enhancement thus falls to the OEM design team as well as the manufacturing team. OEMs must take action upstream in the design process to make specifications as wide as possible. Stating that a process meets specification is no longer good enough; increasingly, being able to state that the process stays clustered around the target value is important.

Post-Mortem Processes

Another tool to slow or stop the flow of covert money loss is a post-mortem process after various program milestones are completed, such as a new product or technology introduction. The post-mortem team should meet on a scheduled basis, probably associated with a quarterly business review, but separate from any all-encompassing business review meeting. All participants should agree among themselves that the review process should focus on learning rather than on assessing blame. The group should also agree on what constitutes successful project interim and overall success criteria.

Within this team-spirited meeting, the group should then brainstorm tactics and strategies that have worked well and those events, strategies and tactics that have not met with success. The group should work toward root causes, often embedded in poor communications and erroneous assumptions. The team's root cause analysis and corrective action plan would then be published to both OEM and EMS stakeholders on and outside of the program team, and action items would be tracked to completion.

Adequate Costing Systems

Unless firms have mapped their processes, they cannot understand those processes at the task level. Except when costs spike due to rework and when a customer complains about product or service quality, management does not usually have knowledge of which processes and tasks have performed poorly. Taking action against the reasons for lost money is of little value if no costing systems are in place to detail the money losing activities. At best, only portions of the bleeding will be stopped.

Traditional costing systems suffer from an inability to link root causes of consumed resources to wasteful activities. Traditional costing systems also suffer from poor project-to-project allocation of overhead consumption. As mentioned above, since many firms do not understand their process flows, they cannot understand how resources are actually consumed within programs. At best, the firm can only define how many dollars were paid out in support of the customer.

Companies and divisions of companies that have implemented project-costing models have saved considerable sums of money. For example, the U.S. Customer Operations Division of Xerox Corp. saved $200 million over four years by implementing cost of quality programs (Carr 1992). Tenneco (Feigenbaum 1997) and Westinghouse (Gupta and Campbell 1995) have reported similar gains from project quality cost systems. Juran (1989) defined cost of poor quality as those costs that are incurred because products or process outputs are not correct the first time and every subsequent time.

Marrying the concepts of activity based costing (ABC) and COPQ yields the desired cost accounting structure for the customer program-oriented firm. ABC relies on identifying the firm's processes. Once the processes are established and an accounting system built around them, ABC measures the costs and cost drivers of each process activity. Wasteful process steps become identifiable. Out-of-scope activities are highlighted since they do not have an established place in the cost structure.

Activity-based costing with a COPQ flavor provides a strong tool to the EMS provider because it separates each customer's profit and loss to the task level. This separation then allows program managers to objectively assess the individual customer's contribution to the EMS provider—not just profit dollars but overhead allocation, sales portfolio strengthening and return on invested capital (ROIC).

Conclusion

Both OEM and EMS management share responsibility, in equal measure, for money lost through not evolving their OEM/EMS relationships. Strategic communication of goals is lacking, and tools that improve project profitability are ignored in favor of expensive technology. Advanced, fundamental and low-cost practices from related manufacturing industries are also ignored.

A tool to identify the true cost of OEM/EMS programs is a marriage of cost of poor quality and activity based costing. This tool allows the EMS provider to understand their OEM customers' programs from the task level to the strategic level. If the EMS provider then takes this financial information and communicates it to a receptive OEM management, both parties will benefit financially from the smoother relationship that results. ■

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