

## Exploring the engine room of manufacturing companies

*Productivity is where the action is. Manufacturing companies can look at indicators such as inflation, market values, exchange rates and a number of other indicators to indicate the economic well-being of a company, but in the long run, productivity makes the difference. If products are not manufactured productively, the company is going to lose money. This article uses results and materials from a number of reputable companies such as Aberdeen Group, AMR Research and Proudfoot Consulting to explore what manufacturers are doing, or not doing to improve their company results.*

**By Gerhard Greeff - Operations Manager at Bytes Systems Integration**

I have often used the simile of a passenger liner when describing the conditions in a typical manufacturing company. Between the lights and the fanfare at the top, the captain and his officers (read CEO and Directors) mingle with the passengers (read customers), direct the activities on board the vessel (read company) and every so often send down instructions regarding the direction and speed of travel. On the bridge, the captain and his officers have radar, compass, speed and all sorts of information available to ensure the comfort of the passengers.

Contrast this with what the harried Chief Engineer (read Production manager) has to work with deep down in the dark underbelly of the vessel. No bright environment, no windows to see where the vessel is going, only a communication unit with the bridge from where the voice of the officer in charge shouts down instructions, urging the engineer to coax out the last ounce of power from the over-stretched motors (read manufacturing plants). In fact, the engine room is place where the vessel is moved from. If anything goes wrong here, the vessel is stranded; no matter how accurate the course has been calculated and set by the captain.

### Manufacturing companies today

The above situation still currently exists in numerous manufacturing companies. The board of directors has the financial information readily available within the company ERP system. They assess profits, sales, customer spending patterns, cost trends and manufacturing performance frequently; regardless of the army of employees collecting information to continuously feed the frenzied information hungry system.

On the factory floor though, the situation is completely reversed. The manufacturing facility is well automated, with instrumentation, PLC and SCADA systems collecting and displaying real-time information all the time. This information is unfortunately inadequate for the manufacturing managers to plan and control the different manufacturing operations in a coordinated manner. To make decisions and ensure effective and efficient operations, information is necessary that provides context and relationships between operations and processes. The useful information is normally required at a finer granularity than that provided by the ERP, but not as detailed as the information on the SCADA. This information is required by the production manager to:

1. Anticipate (forecast) the production to be accomplished;
2. Plan and schedule the production;
3. Assign production (products, raw materials, personnel and equipment) to be accomplished;
4. Coordinate, control and follow-up on the production operations;
5. Measure the results obtained from the production processes and take corrective action when deviations occur;
6. Report on the effectiveness of the production operations.

The above six elements are all interrelated, and if one is ineffective, the entire system is ineffective. Without the information to achieve the above being readily available, it will be difficult for the manufacturing manager to affect or even calculate production performance. The layer of systems that can provide the above information is commonly called MES, or in terms of the ISA 95 standard, level 3 systems.

**What do management executives think?**

*So you think your company's manufacturing systems are good or at least adequate?*

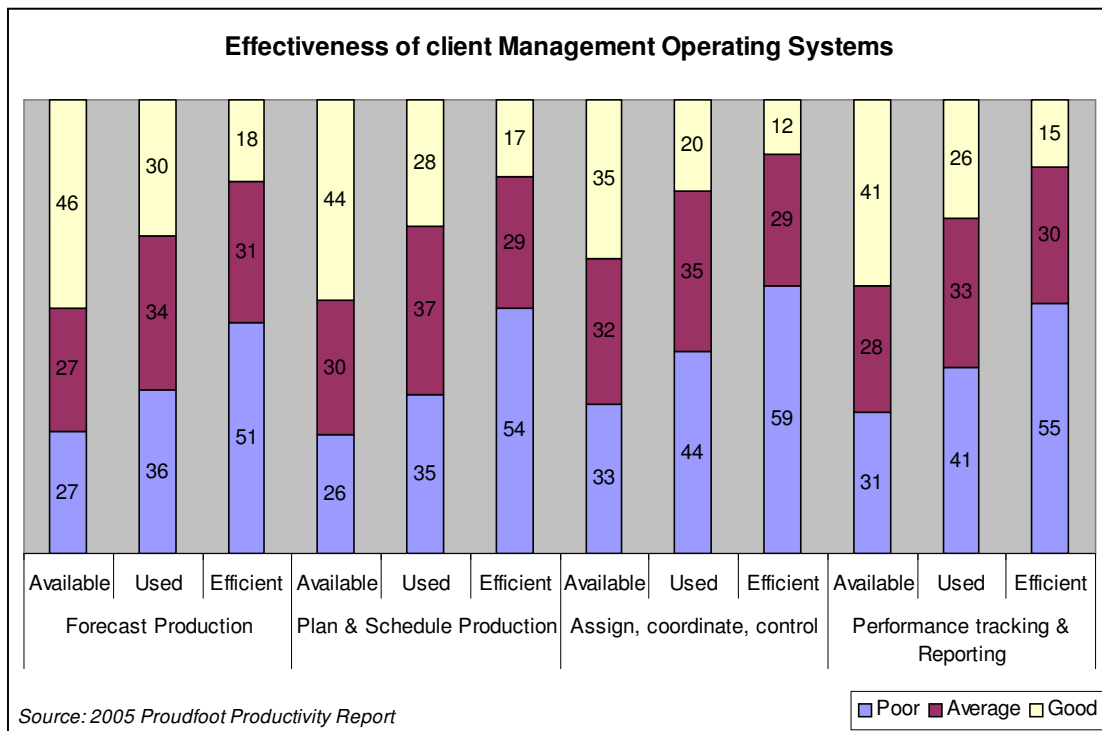
If you answer yes, you are not alone. Let us consider the data captured during 2,614 studies from 100 medium to large companies in 12 countries (including South Africa) by Proudfoot consulting in 2004 and published in a report in 2005. In Table 1, compare the executive perception of the state of their Management Operating System (the Proudfoot convention for systems that enable the six elements above) and the findings by Proudfoot.

**Table 1: Management Operating System Effectiveness**

	<b>Poor/ Inappropriate</b>	<b>Good/ Appropriate</b>	<b>Average/ Improvement required</b>
<b>Executive perception</b>	<b>8%</b>	<b>58%</b>	<b>34%</b>
<b>Proudfoot assessment</b>	<b>41%</b>	<b>29%</b>	<b>30%</b>

*Source: 2005 Proudfoot Productivity Report*

Table 1 clearly indicates that the perceptions of management regarding their operating systems differ widely from the actual situation in the company as found by Proudfoot. If this is not enough, there is also a big difference between the functionality available in the systems and the way that it is actually used. Consider Figure 1, showing that where good systems are actually available, they are only used efficiently less than 20% of the time, and that more than 50% of the systems are either inappropriate (poor) or needs improvement (average). The results of the study clearly indicate that systems are insufficient, inappropriate or not adequately used where available.



**Figure 1: Effectiveness of Management Operating Systems**

The Proudfoot study states this in the following manner *“Most executives don’t perceive their existing systems to be in need of much attention,”* and *“Executives don’t appear to see the connection between what they believe to be the causes of inefficiency and their existing Management Operating System.”*

I have come across both the skeptics and the managers that are oblivious to the fact that the systems they invested in were not being used.

Let us look at the skeptics first: Some managers argue that they have the same amount of information they had for the past five years, and that was good enough until now, so there is no problem. What they often do not realize is that they are doing the same amount of work with fewer subordinates, so there spare capacity they used to have to make up for the confusion down the ranks are not there anymore. With fewer employees, everyone needs to be better informed and be able to make intelligent decisions. The days where the manager alone had to know what was going on is long in the past. I have witnessed the change in some of these managers when the first results of a proper information gathering and presentation system came to light. The skeptics most often turn into the greatest champions.

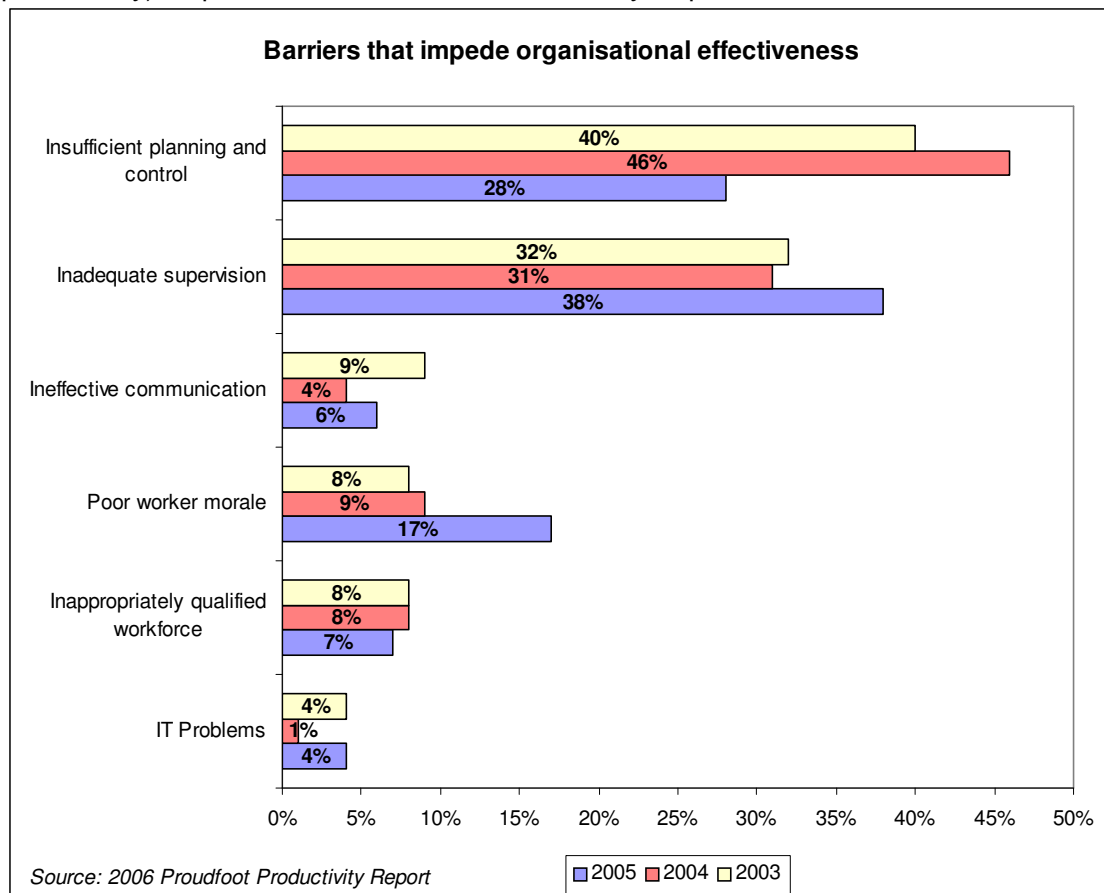
Now let us look at the oblivious: These managers assume that the systems are available and that they are being used. They get all the data they need from the system and often even the expected results, so in their minds the systems are working effectively. What they are often not aware of is that the system are being kept alive only to please the manager, but that in its current state it has little use for the subordinates aside from adding to their workload. The reason for this is that the business process (or workflow) that the system was implemented to drive and the current process are not synchronized anymore. The people are working for the system, not the other way around like it should be. These managers were often intimately involved in the design and implementation of

the systems, so it is hard for them to accept that it has become outdated and more of a hindrance than a benefit.

I suggest you go ask your supervisors and first-line managers how the current systems are helping them perform their daily tasks and solve problems. While you are at it, ask them to show you what routines they have to follow to keep the system current and the spreadsheets they have to maintain to produce your reports every day or every week.

### So what does this have to do with productivity?

Some executives may argue that even if the above is true in their company, that it has not impacted their productivity and that they have been achieving good results regardless, thank you very much. That may be true, but think of the results that could have been achieved if the systems were better and more efficiently utilized. To illustrate this, let us consider some other findings from Proudfoot. Figure 2 indicates the six barriers identified by Proudfoot that impede organizational effectiveness (company productivity) as published in their 2006 Productivity Report.



**Figure 2: Barriers that impede organizational effectiveness**

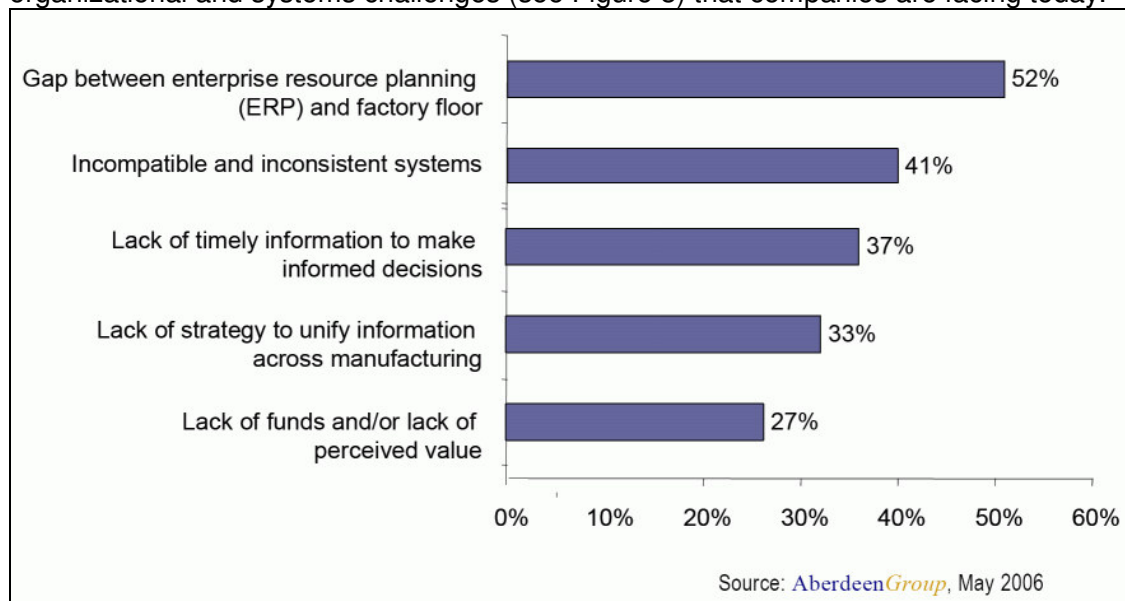
The graph indicates that the major barriers impeding productivity are “*Insufficient planning and control*” and “*Inadequate supervision*”, adding up to 66%. If manufacturers thus improve their ability to coordinate, plan, control and supervise, they will be able to dramatically improve productivity.

To enable better planning, control and supervision, more accurate and readily available information is required at the right time. This requires better systems that are more

efficiently used. The reality is that the supervisory systems (SCADA) supervisors have available to manage their daily functions are normally completely separated from the command and control systems (ERP) of the business. Supervisors do not get adequate or clear direction from their management through planning and priority information in order to react to problems appropriately. They thus operate in the dark most of the time. In one company recently a manager was actually surprised when I suggested that his supervisors need to be supplied with better decision-making information. His actual words were “Do you think it is wise having them make those decisions?” Well, they are making those decisions anyway on night shift right? So is it not a good idea to give them the tools and teach them to make better decisions? Yes, the manager may be available 24 hours per day, and only a phone call away, but from personal experience I know that at two o’clock in the morning, without seeing the actual problem and without the data in front of me, even I am not at my best.

One of the major problems companies face is that integration between the ERP and the factory floor are not that straight-forward, and to provide useful decision making information, data is needed from both levels. Working from the assumption that supervisors are not capable to make decisions anyway, it follows that the cost-benefit analysis will go against attempting any integration.

All of the above is supported by the recent study by the Aberdeen group, identifying the organizational and systems challenges (see Figure 3) that companies are facing today.



**Figure 3: Internal challenges companies face**

The typical information that should be available for the supervisor to react appropriately in the event of deviations should answer questions similar to the following: What production is planned for the section in terms of priorities and alternatives? If a stock-out of packaging materials occurs, what alternative products can the section pack that will still enable the section and the business to achieve profitable operations? If an equipment breakdown occurs, what is the priority of the products being manufactured on the other lines and does the supervisor need to change products to negate the effect of the breakdown? Is the section producing at the correct rate according to plan (not more, not less)? Is the section producing the correct quality product, and if not, what action should be taken? How does the current shift perform in relation to other shifts?

The tools (SCADA systems) that supervisors have available to address the above provide a lot of detailed process control data, but little information that enables problem solving and decision making to answer these questions. To obtain this information, they often have to extract data from different systems (electronic and paper-based) and manipulate the data to produce the relevant decision-making information. Supervisors also spend a great deal of time collecting, collating and manipulating information in order to generate reports and to record data that assist them to do other administrative tasks - such as generating material orders. A lot of this time can be better spent doing more active supervision of the actual operations.

### **Do mid-level management and supervisors really have it that bad?**

This brings us to another interesting finding from Proudfoot in their 2005 Productivity Report. The study determines the amount of time people in supervisory positions spend on different supervisory activities. Table 2 indicates how supervisors spend their time and the ideal activity/time split.

**Table 2: How supervisors spend their time**

<i>Source: 2005 Proudfoot Productivity Report</i>	<b>Proudfoot Observation</b>	<b>Supervisor Ideal</b>
<b>Active Supervision</b> Assigns work with specific expectations, actively follows up to review progress, investigates and actions variances, formal problem solving.	7%	36%
<b>Passive Supervision</b> Wandering about, reactively dealing with problems, operators coming to supervisor with problems.	20%	17%
<b>Training</b> Leads training and skills improvement. Enhance operator performance. Reinforcing training through informal on-the-job training.	2%	11%
<b>Administration</b> General paperwork and reports. Reading e-mails. Attending meetings.	39%	18%
<b>Working alone</b> Carries out work of subordinates.	13%	11%
<b>Non-value added time</b> Activities that do not contribute to effective management of the area.	19%	7%

From Table 2 it is clear that supervisors spend a lot of time doing the wrong things. They do not plan and follow up and they do not spend time training. A major contributor for this may be that they do not get adequate direction from management in order to plan, or that no information is available to check progress until the end of the shift anyway, making any attempt to check on actual progress a waste of time. It could also be that the culture of the company is such that everyone operates in fire-fighting mode, as production management also operates with a lack of timely information (as supported by Figure 3).

Interesting to note (see Table 2) in addition is that 39% of supervisor time is spent on administration (collating information for reports). This is more than 3 hours in every 8-hour shift! From personal observations in various companies, the above numbers fit.

### **Light up the engine room**

Taking into account all the tables and figures above, it becomes apparent that better, more timely information in the right context can go far in removing effectiveness barriers and increase productivity. Manufacturing companies need to light up their engine rooms and provide their production personnel with more and better information. With improved, timely information, production management can be far more proactive and effective in driving the objectives of the company.

In one company that I have been involved with, they have had to write off millions of rands of product every year. The materials they received and the product they produced just never balanced out, even after implementing just about every security measure they could think of. They could never track down the problem until they implemented a MES system integrated with their ERP. With the correct and accurate information available and easily accessible in real-time, showing the movement of the materials, they identified and resolved the problem within the first three weeks after implementation, paying for the complete project within the first month.

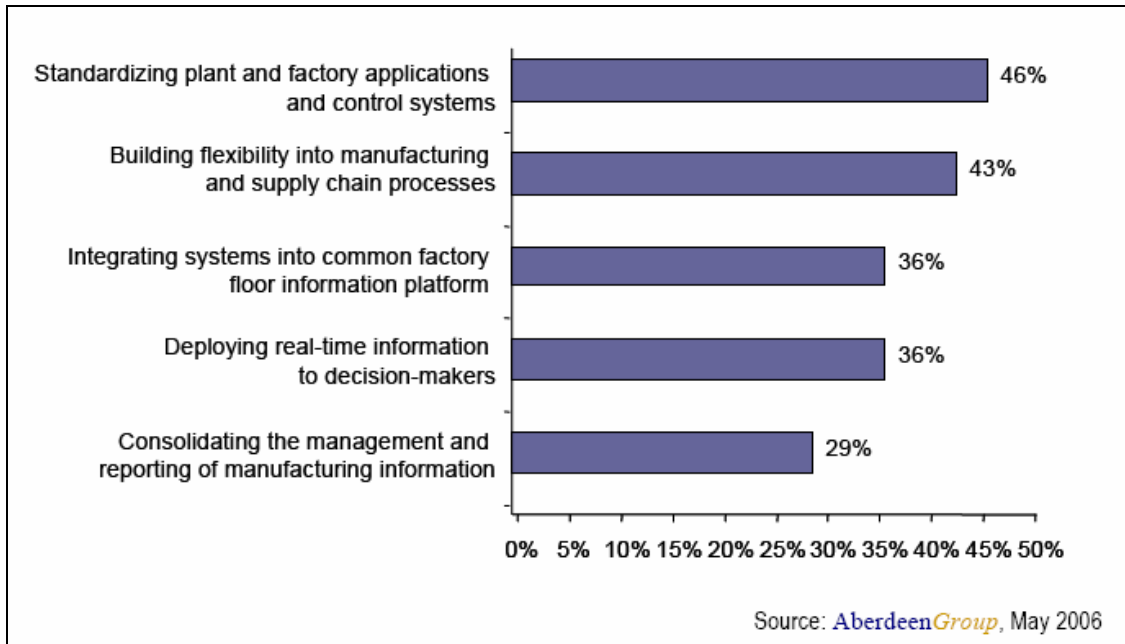
It was not even any serious breach of procedure, or theft or product waste, but a simple thing like weighing containers received in a different manner than used by the plant upstream in the value chain for tare weight/nett weight calculation. With the data being transferred on paper between people, this was not noticed for a number of years, until an integrated ERP and MES were implemented.

Companies are beginning to realize that financial, sales, supply chain and strategic planning alone will not solve all their productivity problems. They are realizing that without real-time feedback from plant-floor systems, these tools are just about as useful as a white-board schedule that is only changed on a weekly basis. Manufacturing companies are starting to take note and are actively looking at providing information closer to the factory floor.

### **How are World Class companies approaching this?**

A study by the Aberdeen Group (see Figure 4) indicates that companies are building flexible systems that can change with changing customer and business process requirements. Without this flexibility, keeping applications synchronized with changing processes are going to be difficult and costly, and will result in the situation where the people are working for the system, and not the system working for the people as it should be.

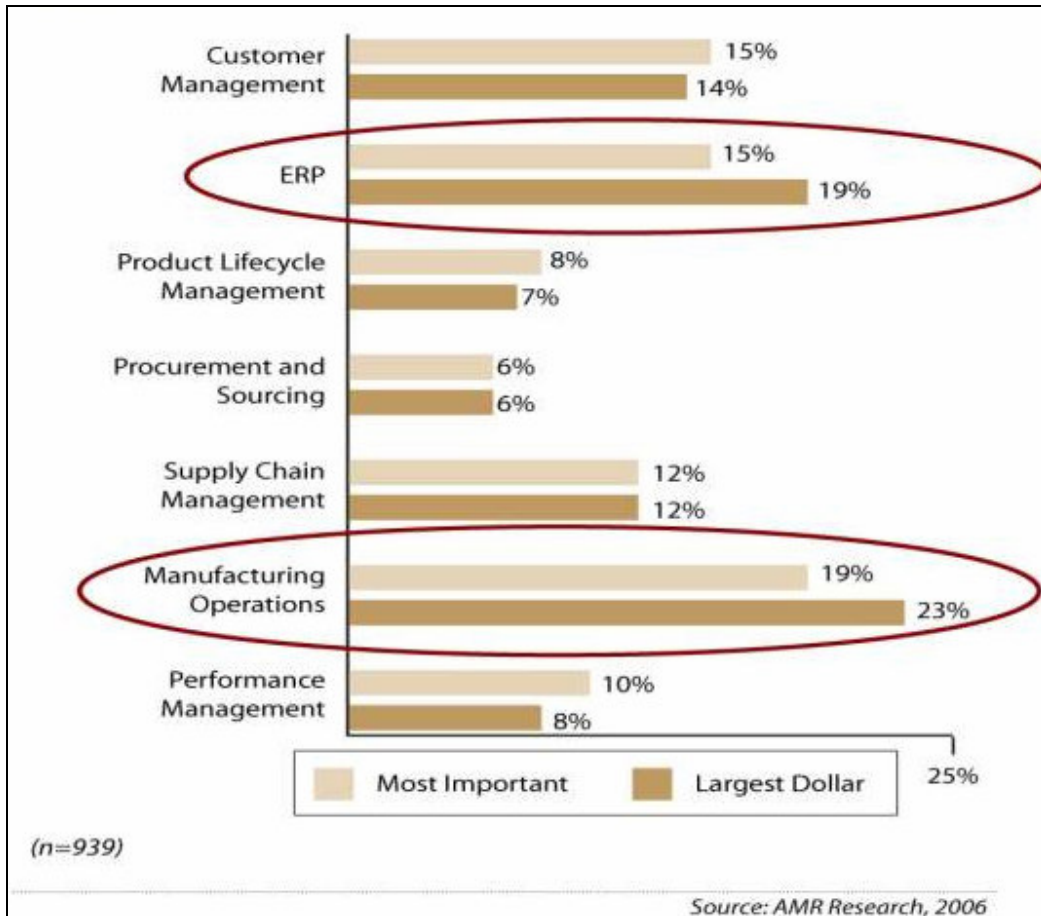
The other approaches discussed in some detail already include bringing decision-making information closer to the factory floor and integrating the factory floor with higher-level systems.



**Figure 4: Best in class approaches**

The results of this can already be seen in the difference between the “Insufficient planning and control” productivity barrier result of 2004 and 2005 in Figure 2, down from 46% to 28%. That this trend will continue is further supported by a AMR Research study published in 2006 (see Figure 5), indicating that companies plan to spend more on manufacturing operation applications (MES) than on ERP applications. This is a turnaround, as a number of years ago until recently the biggest spend was on ERP.





**Figure 5: Application spending priorities for 2007**

As eluded to before, the systems that can really make a difference are at Operations Management (MES) level. MES systems used efficiently can provide production managers with the information to plan and control processes better and more effectively, and supervisors with the decision making information to solve problems and identify trends to be proactive rather than reactive.

I am not talking about just providing more measurement or results information in real-time, as that is what management information systems (MIS) are for. What I am talking about is systems that guide the processes of the company; the business process, the decision making process and the processes of identifying and choosing alternatives when things go wrong.

These MES systems should drive the objectives of the company, not just provide information to the user to make their own decisions. Information is important too, but when something goes wrong, people tend to take the easiest road to recovery. Unfortunately, the easiest road is not always the most beneficial for the company.

The MES systems I am talking about should provide choices, prioritized so that the most appropriate and beneficial choice is at the top of the list. In this way, the manufacturing operations will be more effectively managed by the managers and supervisors, and they will all be comfortable that the choices they make (even though it may be more difficult to execute than the one they would have chosen if it was left up to them) directly contribute to the well-being of the business.

*So is your company doing anything about Manufacturing operations management?*