

This article positions clinical materials management at the core of the evolving competitive arena in the pharmaceuticals industry and describes how CM organizations can be developed to confer strategic competitive advantage.

Clinical Materials as Competitive Advantage

by Harry Clark

Background

Historically, the core competence profile of organizations in the pharmaceutical sector has focused on 'the science.' While not consciously at the expense of other disciplines such as manufacturing and logistics management, this focus has the potential to marginalize operating activities that in other industries, such as electronics and automotive, would be viewed as possible sources of competitive advantage.

This bias toward *discovery* and *early devel-*

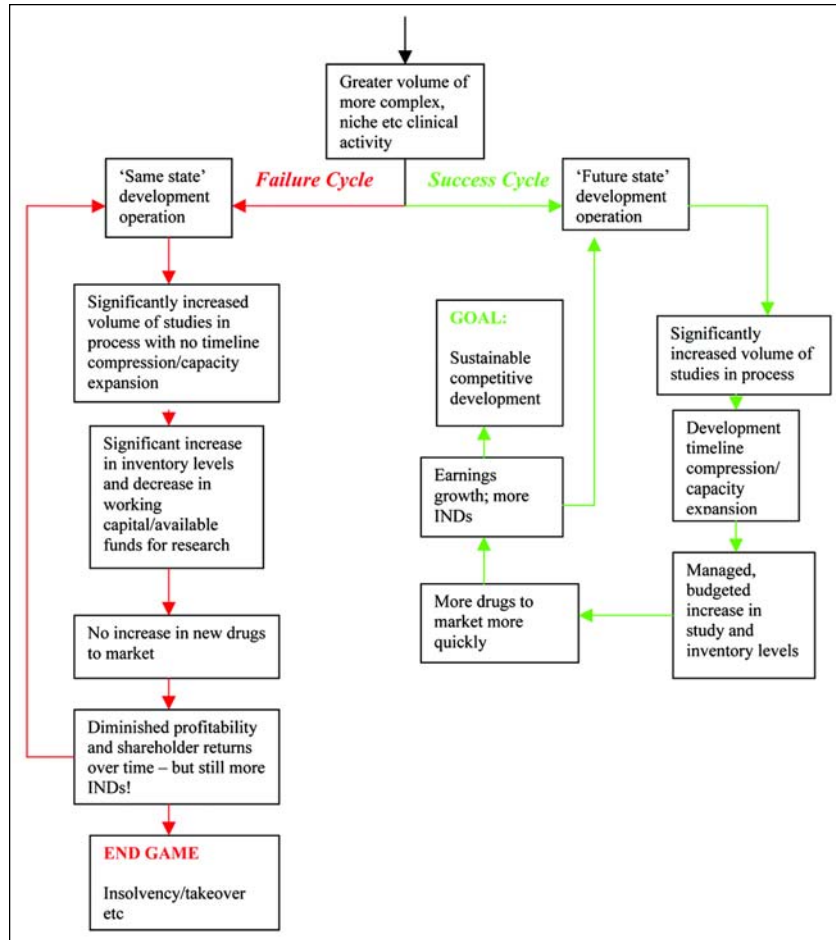
opment and the relative de-emphasis of *execution* activities is in some respects easy to understand in its historic context. In life sciences discovery is the touchstone of medium- to long-term commercial health. It is an expensive process, some estimates suggesting that the cost of a new drug through its development cycle is \$802 million.¹ It is often a process that is born in serendipity and remains bedevilled with uncertainty. The risk and the cost are recognized in lengthy patent protection. Yet, over the patent-protected life of a drug, only

three out of every 10 brought to market generate revenues that meet or exceed average Research and Development (R&D) costs.² This context rationalizes the hitherto accepted logic of concentration on maintaining one or two blockbuster drugs in the portfolio; however, the landscape around pharmaceutical companies is changing and the historic rules may no longer apply.

Current Context

Discovery productivity has been the rate-limiting (and hence the *performance-limiting*) factor in pharmaceuti-

Figure 1. Influence map of development capability.



cal companies bringing new products successfully to market. Therefore, it has consumed a disproportionate amount of the intellectual capital of organizations. Yet – for all of this – the number of New Chemical Entities (NCE) approved by the FDA on an annual basis continues to hover at around 25 to 35.³ The attrition rate in drug development is formidable. According to the Pharmaceutical Research and Manufacturers of America, of 5,000 screened compounds, only 250 enter preclinical testing. Out of these, a mere five proceed to clinical trials and only one is ultimately approved by the FDA.⁴ Over the last 50 years, the entire industry has concentrated its efforts on less than 500 targets. The ongoing revolution in the science driven by genomics and proteomics will transform this situation. Some commentators estimate that there will be up to around 10,000 targets identified in the course of the next decade.⁵ While this will represent an incredible *scientific* challenge to those engaged in discovery and early development, it anticipates an even more fundamental transformation in the *execution* processes of manufacturing, packaging,

labeling, and logistics. ***The competitiveness paradigm shift will be driven by this likelihood: that the historic performance-limiting factors will migrate from discovery to development.***

This shift will pose a fundamental challenge to the competence of pharmaceutical companies. The development process will be at the heart of sustainable competitiveness. ***The successful management of clinical materials processes is central to efficient and effective development and is therefore at the very core of the future competitiveness of pharmaceutical companies.*** How will we ensure that clinical materials organizations meet this challenge?

Competitive Challenge for Clinical Materials

The competitive landscape for pharmaceutical companies will be transformed over the next 10 to 15 years. It will no longer be sufficient simply to be good at the science. Some of the characteristics associated with this change will be:

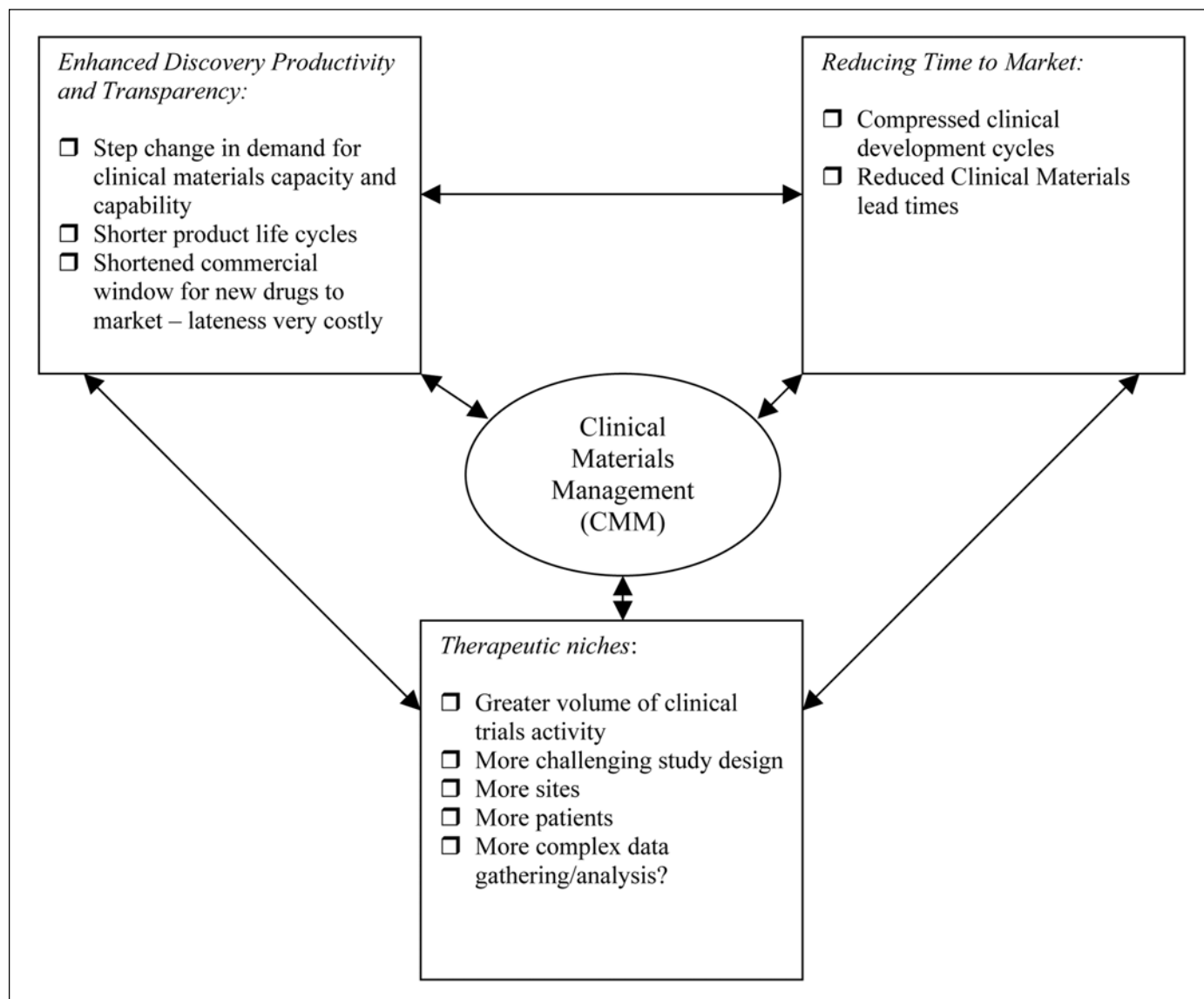


Figure 2. Competitive challenges for CMM.

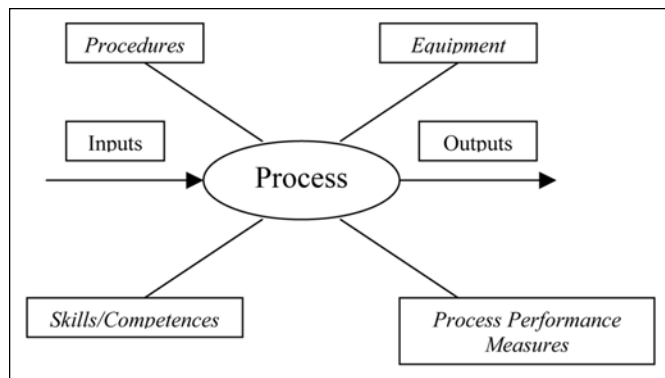


Figure 3. Basic process 'turtle.'

- an environment that is target rich and data rich
- increased discovery productivity
- a trend toward therapeutic niches and ultimately to personalized healthcare
- a more transparent discovery environment delivering competitor products with similar therapeutic qualities faster to market
- a sector characterized by companies with a more diverse portfolio of products, striving to develop a greater number of drugs for smaller markets

All of this has profound commercial implications. This transformation will challenge pharmaceutical companies because it will require them to be simultaneously creative and exploratory on the one hand and systems-adherent and disciplined on the other. Practically, it will mean:

- shorter product life cycles
- a strategic concentration on 'time to market' as the earnings window for each drug shrinks
- a specific focus on the compression of development lead times
- a consequent expectation of improved development efficiencies – more in the pipeline and more to market *with* significantly-reduced cycle times, but *without* proportionate increases in cost

The effective management of clinical materials is central to the success of the future pharmaceutical business. Increased discovery productivity with no corresponding enhancement of the development processes will exacerbate the commercial pressures on businesses.

Conversely, improved discovery performance with greater development capacity and capability is the key to success. The former is a self-regulating closed-loop that over the lifetime of the development cycle will consign laggard compa-

nies to history – unless of course they get lucky. The influence map in Figure 1 describes the situation in abstract.

The commercial imperative of the influence map is unarguable. Irrespective of the degree of sophistication of the development operation, every organization will be compelled to engage in significantly increased levels of development activity. This will remain the case – will, even, be particularly the case – in situations where profitability and returns are in decline over time. In such situations, this 'logic' will persist until the business proposition can no longer be sustained. For some players, this will be the end game.

Therefore, unlocking development potential in the pharmaceutical industry is fundamental. In all industries that have experienced similar 'market life cycle' transformation – the automotive and electronics sectors are particularly appropriate analogies – the very language of operating undergoes change. Phrases like 'time to market,' 'development lead time,' and 'mass customization' become common currency as marketing behavior becomes niche and even personalized. Success demands that operations planning and logistics are core competencies as companies are required to become more agile and responsive within a sensible cost framework. Inventory management practices such as Just-in-Time are adopted in response. Effective planning and materials management are at the very heart of making this happen. The pharmaceutical industry will be no different and the challenge for clinical materials management operations will be significant as they grapple with an acute and growing focus on cycle times and throughput performance.

Meeting the Challenge

In the immediate future, a number of competitive issues will confront the clinical materials operation - *Figure 2*.

Each of these is a challenge in its own right. Together, they ask some fundamental questions of the capacity of pharmaceutical clinical materials management operations to transform themselves.

Clinical Materials Management (CMM) is a process in the product development operation of pharmaceutical companies. Typically, it describes the following discrete activities (or sub-processes) – the planning and coordination of clinical materials to sites for trial activity; manufacturing; packaging; labeling; and distribution. Activity is commenced with some kind of demand signal in the form of a forecast, usually originating from a marketing operation and translated through the clinical function. At its most effective, clinical materials management operates in the background and doesn't appear on the clinical development critical path. Visibility usually only means one thing – that somewhere a clinical trial is being delayed and that this delay will cause the business lost revenue. While important, focusing on the development critical path fails to describe accurately the real underlying, background performance issues surrounding many clinical materials organizations. Neither will it enable the critical question to be posed – just how much potential is there for improvement in the performance of clinical supplies functions? In the competitive situation described above, this

question demands a response. However, each of the discrete activities referred to above is an *execution* activity and historically these have not been viewed as bestowing competitive advantage. This is misguided. In the new competitive arena, competence in these activities will be a 'must have.'

Across organizations there are common failure symptoms that inhibit CMM operations from working optimally. Some are related to organizational performance. Among these are acute and persistent material lateness; materials shipped in wrong quantities; frequent capacity clashes and resource competition; and moving bottlenecks. Others are 'softer' and more personal, but highly relevant to the underlying causes of these symptoms – working in a clinical materials function can be a lonely and misunderstood vocation. There is limited potential for the upside associated with success, but plenty of scope for the flak associated with failure. This type of situation can be stressful, prompting high levels of turnover at an operational level and consequent knowledge-flight. In this context, organizational learning can be elusive.

The above is frequently compounded by the absence of a process-based performance measurement system. So when questions on performance are asked, the responses will frequently be subjective and can be substantiated only by manipulating data synthetically from a variety of sources. The lack of objective measures of performance and supporting indicators makes managing more difficult. The ability to build, sustain, and work effectively through personal rela-

tionship networks, together with the ability to acquire and deploy knowledge on a limited 'local' basis, are frequently parts of the essential skill set in CMM. This often compensates for the relative absence of a process focus.

So, how do we equip the CMM operation for the challenges of tomorrow? Well, that's easy, isn't it? We do a quick heads-up on User Requirements, cross our fingers, and spend several million dollars on an elaborate Enterprise Resource Planning tool. Press the buttons and let it run. Now, these ***systems do have a role, and that role is clear. It is a subordinate role. It is subordinate to the process. And when did we last spend several millions of dollars understanding that?***

Let's look at the *process* in just a little more detail. Each of the operating failures described above – the materials that are late, or the Project Manager that is absent through stress – is a failure of the process. And the failure modes are remarkably common. They are a function of the pharmaceutical competence profile discussed earlier. Let's look at some of these process 'holes:'

Capacity Modeling

Operational capacities are frequently unknown. Industrial Engineering is uncommon. Accurate information on tasks or activity cycle times is absent across manufacturing, packaging, labeling and warehousing. Therefore, there is little in the

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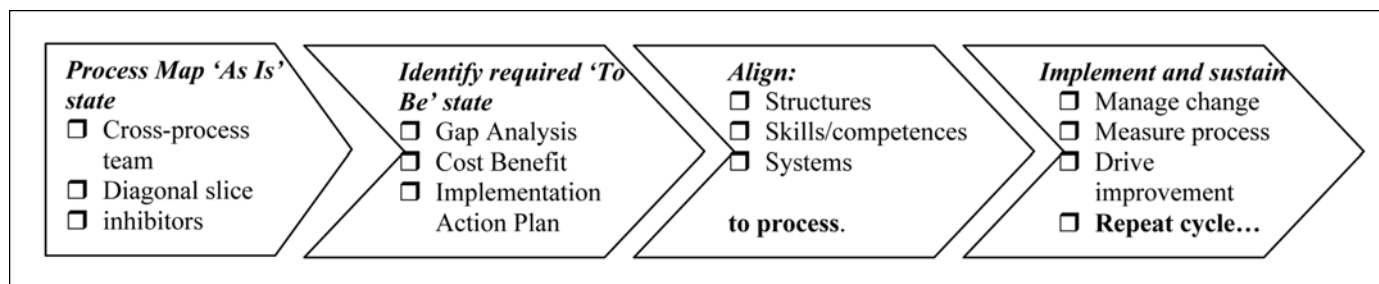


Figure 4. Process improvement change model for CMM.

way of a meaningful reference point for the planning activity that represents the core of every CMM regime.

Capacity Planning

The ability to reconcile the consolidated demand signals placed on the organization (from marketing, commercial, etc.) with available capacity and resource is frequently absent in CMM operations. In the absence of a Rough Cut Capacity Plan, commitments are made blindly.

Planning and Scheduling Tools

Planning and scheduling tools are fundamental tools enabling the planning and scheduling of inventory, manufacturing, and distribution. One survey indicated that almost 40% of CMM operations use none of these tools.⁶ In their absence, there is very little to guide activity.

Manufacturing

There is significant scope for the more effective use of best practice manufacturing management techniques in development manufacturing. The deployment of manufacturing resource – for example, labor and machines – is frequently unplanned. The application of Statistical Process Control (SPC) techniques is rarely evident. Even at relatively low levels of machine utilization there are frequent capacity clashes.

Performance Measurement

CMM organizations produce masses of data. Few have developed a meaningful process-based performance measurement system that identifies and tracks key process parameters and uses this information to drive improvement.

Process Optimization

If the process optimization model is reduced to its simplest form (see Figure 3), many clinical materials operations might consider themselves delinquent.

At its simplest, a process is an activity or a series of activities designed to produce a required output. No process is self-managing and all processes tend to wander ‘out of control’ over time. Therefore, if processes are to continue to function as intended - that is, to continue to produce the required outputs to the required standard – they must be managed. This management can be described along four dimensions – *equipment, procedures, skills/competences, and process performance measures*. Each one has meaning and relevance and each will be reviewed below.

Equipment

These are the tools necessary to do the job. In the clinical materials management environment, these are things such as information systems (inventory management, project management, planning and scheduling tools, etc.); manufacturing machinery; automated picking systems; packaging equipment. Some simple questions can be asked – *did we really optimize our processes before we implemented our systems? Do our systems enable the process to work as smoothly as possible or are we continually formulating ‘workarounds’? Is our manufacturing equipment capable and in-control? Is it properly maintained? Is it available when needed or often unavailable or out of commission?*

Procedures

The pharmaceutical environment is closely regulated and adherence is simply the admission price to the game. But being compliant is not enough. We also must be competitive, and our procedures must have an operational as well as a regulatory focus. Again, some simple questions – *do our procedures really help in describing and understanding key parts of the process? How do we manage inventory, ordering, and re-ordering materials? How do we manage drug material obsolescence? How do we set up machines? How do we interpret and use statistical process control information? How do we load and locate inventory?*

Skills/Competences

The skills required to succeed in an *execution* operation are fundamentally different from these necessary in a *science*-based environment. The clinical materials environment has many similarities with a Fast Moving Consumer Goods (FMCG) situation. They share an emphasis on manufacturing, logistics, packaging and distribution. Some more questions – *is this recognized? If I look around at my colleagues, how many have non-pharmaceutical related academic backgrounds? How many have worked in other sectors – electronics, automotive, retail/distribution? Does our Continuing Professional Development in the appraisal process reflect the demands of the jobs that we do? Have we identified the skills necessary to manage our CMM processes optimally? Are our people trained, developed, and competent to deploy these skills appropriately?*

Process Performance Measures

Every process has outputs. These outputs represent the

inputs to another process, or potentially someone else's sleepless night. *Do we understand what is expected of the process? Do we know what our key performance measures are? What are our performance indicators? Do our systems enable us to capture information on these? If we have this information, do we use it productively? Do these indicate that our process is improving? Getting worse?* There are relatively few key performance measures in the clinical materials operation. Three appear to be common across most companies – some form of *cycle time metric* (manufacture, package, ship to site); *delivery to plan*, and *waste* (API, etc.) as a function of inventory and planning management. An effective performance measurement system; however, does not focus exclusively on *Results Measures*. It will be derived from the optimized business process and also will identify *Enabler Measures* central to process performance. These will be process-specific. They enable us to actively manage process improvement. To give some examples - in the planning process they may be '*forecast accuracy*' and '*schedule adherence*,' in Warehousing, '*inventory accuracy*' and '*inventory efficiency/inventory turns*,' and in Manufacturing, '*machine efficiency*' and some appropriate measure of *output quality*.

Organizations equipped for the challenges of the future competitive arena will be able to answer most of the questions posed above affirmatively. Most organizations will have to develop that capability.

Building CMM for Competitive Advantage

There is no short cut to equipping the clinical materials operation for the competitive challenges ahead. There needs to be real thought on (a) how the operating process currently performs, (b) on where the blockages and inhibitors are, (c) on how the process should be configured to best meet the needs of its customers, (d) on how the organizational structure should be designed to make the process work to best effect, (e) on how to align the skills and competences of people to the needs of the process, (f) on how to properly align systems to the process – *information systems* (such as software-based advanced planning and execution tools, and management information systems to report on identified metrics), and *management systems* like performance management. The process of change is depicted in Figure 4.

This cannot be a one-off activity. At a macro level, the business environment continues to change. In the pharmaceutical industry this is a certainty, and its implications are anticipated earlier in this article. At a micro level, all processes tend to wander and over time need to be re-centered.

A number of features of this change process are worth commenting on. The 're-engineering' activity associated with the first two chevrons must not to be an exclusively top-down, functional exercise. The team that defines the future state of the process must contain some people who work at the sharp end of the operation. Representation across the processes also must be 'designed-in' to this team. Change is not sterile, and those affected by it must feel some ownership of the outcomes.

Clearly, the extent to which issues subverting process

performance are identified is a function of the level of development of the operation. Typically, though, the number of identified process inhibitors (those features of the process that stop it from working as effectively as it should) can run into the low hundreds. When distilled, a range of practical issue-clusters that limit the ability of CMM operations to perform is often highlighted. Common across organizations are issues such as: *unstable forecasts and unclear requirements; poor quality of documentation and supporting information; seriously-compromised planning regimes with under-developed or under-utilized planning and scheduling tools; inability to manage clients and sponsors; unnecessary replication of activities and insufficient standardization; unclear accountabilities; processes that are highly personalized; little visibility on performance and the absence of relevant metrics.*

The future-state ('To Be') of the operation addresses the things that subvert the 'As Is' process. Communication across the operation is vital, soliciting input and qualifying conclusions. Operational performance gaps are identified and the benefits associated with moving to the future-state defined (as far as possible, financially).

Clearly, in all of this, there is no 'silver bullet.' There is work to be done and understanding to be gained. ***The solutions are about simplicity and clarity, about people, and learning and understanding.*** About ability and accountability. And about systems that both support people

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and enable the operation to deliver the necessary outcomes. The process that delivers this has to be inclusive and transparent and it must become part of the fabric of the organization. Implementation projects must pull people in to the change process. Above all, the cycle of improvement described in Figure 4 must become a regular (if abbreviated, as the level of sophistication and competence grows) routine for the operation.

So what might all of this mean for clinical materials organizations?

The Competitive Performance Benefits

The level of benefit is a function of the level of development. Experience across a number of pharmaceutical players suggests that many of the metrics associated with clinical materials management can be improved dramatically. Other equally valuable benefits include the ability to select and de-select pipeline drugs earlier in the trials process. Yes, kill early and kill often. But don't allow process under-performance to kill value or to allow promising drugs to slip out of the pipeline.

In organizations where clinical material supply appears on the critical path, *lateness can be virtually eliminated*. Where this is the case – either occasionally or persistently – the financial benefits of this improvement are huge and can be worth tens of millions of dollars.

Earlier in this article, we described the changing competitive situation facing pharmaceutical companies – the competitive imperative to expand the development pipeline and bring more new drugs successfully to market in ever-decreasing cycle times. This focus on development as the potential constraint puts clinical materials center stage and compels a focus on Order Fulfillment Cycle Time. Typically, this can be reduced by around 10-25 days achieved through time compression in planning and procurement, development manufacturing, packaging and warehousing/distribution.

Parallel capacity increases of between 25% and 40% are typically attainable with a corresponding step-change in throughput capability. Waste reduction of 10% to 20% also is commonly achieved. Recent research supports these conclusions.⁷ Again, the financial implications are very significant. Ultimately, over the course of an ever-decreasing number of years it is the potential to bring additional NCEs to the market successfully.

Conclusion

The pharmaceutical sector faces a future full of opportunity and challenge. The sea change in emphasis anticipated by the step change in discovery productivity and the associated focus on development operations puts the effective management of clinical materials at the center of the future competitiveness of companies. The successful players in the sector in 15 years will be those who enabled their development operations to make an equivalent step-increase in performance. This cannot be achieved without transforming the capability

of clinical materials management operations. For those who are successful, this will be the challenge they have met.

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