Knowledge Management in the Pharmaceutical Industry

Enhancing Research, Development and Manufacturing Performance

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GOWER
Realising Pharmaceutical Value

Introduction

Over the years, a number of Knowledge Management principles, techniques and approaches have been applied in the unique environment of the Pharmaceutical Industry. We believe that Knowledge Management will continue to have a role in the industry in the twenty-first century. To understand the nature of this role, and how it has evolved and will continue to do so, we must first get some understanding of the Pharmaceutical Industry itself.

The Pharmaceutical Industry has been undergoing a major transformation since the heady days of ‘Big Pharma’ in the 1970s and 1980s. Patent expiry, the rise of generics, and the decline of the blockbuster drug have all changed the landscape over the last 10–15 years. For research-based pharmaceutical companies, with huge costs and long lead times to develop new products, it has become a major challenge to achieve the return on investment. At the same time, jobs are being shed in the western pharma ‘homelands’ and regulators and the public are more demanding than ever.

The boom of the Pharmaceutical Industry from the 1950s to the 1980s was driven largely by research-based companies coming up with blockbuster drugs, for example for lowering blood pressure, controlling blood sugar and getting rid of infections. The last of these drugs was Viagra, which was launched in 1998.

Through these years this blockbuster model was a simple one: pump enough money into R&D and hope that your scientists come up with something that will treat a huge proportion of the population, and generate large amounts of money to both cover the experimental losses involved and reward the shareholders.

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1 Introduction developed from views expressed in ‘The End of Drug Discovery?’ an interview with Patrick Vallance, Head of Drug Discovery, GSK and Professor Paul Workman, Director of Institute for Cancer Research, BBC Radio 4, 22 May 2012.
However, the blockbuster model is very inefficient: there is a huge failure rate (usually referred to as ‘attrition’) in the proportion of molecules from the early stages of discovery making it through the later clinical trials. Some argue that pharmaceutical companies were benefiting from the easily discovered ‘low hanging fruit’ which are just no longer there and companies are recognising that they need to change the way they approach the whole process of R&D, with all the challenges and new demands on knowledge that this brings.

In fact, there is a recognition that the Pharmaceutical Industry needs to fill significant gaps in its knowledge both about human diseases in general, and about the mechanisms of action of drugs. An indication of this is how many diseases, such as breast cancer, are being broken into sub-sets of mechanisms or defined states, which will ultimately be treated by individual medicines, as opposed to twentieth century ‘catch-all’ approaches. (An example is the stratification of patients and the rise of a personalised medicine approach for therapeutics, diagnostics and devices which we talk about further below.)

In addition, the patents from the most lucrative drugs are now expiring, and new molecules are no longer coming through at the rate that they were. With the financial climate exacerbating the situation, experts are now referring to the ‘valley of death’. In the words of Professor Paul Workman:

This is the valley between basic research and innovation on the one hand, and patient benefit and commercial success on the other, with this chasm in between into which there is a lack of funding and a lot of failure.

Some of the ways in which the Pharmaceutical Industry is responding to these pressures in R&D is to reduce costs by shedding jobs and closing sites, reduce risk by focusing on less risky therapeutic areas (for example, by pulling out of areas like neuropsychiatric diseases), and rely on academia to address some of the most risky aspects of drug discovery.

The Manufacturing element was previously a lot simpler too with most products being sold in the common forms of tablets, capsules, creams and ointments, liquids and injectables. However, over the last 30 years, the advent of generics has affected Manufacturing in several ways:

- differentiation of appearance – resulting for example in novel tablet shapes and different or more complex packaging;
line extensions – trying to get the consumer committed to a specific product variant that is not covered by the generics;

• novel delivery devices – that can be patented and thus not copied.

And finally, there has been a shift in the supply chain for pharmaceuticals. In the boom years of the Pharmaceutical Industry, apart from a significant representation in Japan, most of it was concentrated in Europe and North America. Over the last 20 years Manufacturing in Europe and North America has declined in the big pharmaceutical companies. There has been a major growth in generic manufacturing in these areas, but more importantly manufacturing has become more globally spread, combined with a huge development of manufacturing in India, and to a lesser extent in China. The desire for governments to see products produced locally and reduce imports (sometimes using prohibitive tariffs), and the diversification described above, have resulted in more facilities, producing smaller volumes, spread globally and resulting in complex supply chains.

The overall result is a significant shift in the approach to drug discovery, a wider range of products with smaller volumes coming to market, often with novel designs, raw materials and devices being sourced from multiple suppliers, and a more fragmented, collaborative, or ‘Open Innovation’ approach to the entire pharmaceutical value chain. This whole transition in the industry has implications for all aspects of Knowledge Management.

In this chapter we will focus on three main topics:

• the evolution of the pharmaceutical value chain;

• how the KM Framework that we described in Chapter 1 relates to the Pharmaceutical Industry;

• the impact that the changing pharmaceutical business model is having on Knowledge Management.

The Evolution of the Pharmaceutical Value Chain

The pharmaceutical value chain has traditionally started from the identification of a drug target and some basic research (or ‘discovery’), involving the synthesis of various chemical structures combined with biological assays, to come up
Figure 3.1   The traditional pharmaceutical value chain
with a number of potential drug candidates. These have then been sifted through further research and development to determine whether they have the desired activity and safety profiles, first in vitro and in vivo pharmacological and toxicology models, and then in a series of clinical studies to support submissions to Regulatory Authorities (such as the Medical Health Research Council (MHRC) in the UK, the European Medicines Agency (EMEA) in Europe and the Federal Drug Association (FDA) in the US). Further development has involved methods for scaling up chemical production and defining the best formulation, transitioning to large-scale manufacture, before final marketing initiatives to get the successful drug to the patient (Figure 3.1).

Whilst all of the processes used along this value chain have evolved in some way over the years, as we described in the introduction to this chapter, one of the most dramatic shifts has been in the starting point for new medicines.

FROM MEDICINAL CHEMISTRY TO BIOPHARMACEUTICALS

Biopharmaceuticals, also referred to as ‘biologics’, emerged in the early 1980s and 1990s as an alternative starting point to chemical synthesis for the development of new drugs. These biopharmaceuticals include proteins, nucleic acids and even living organisms such as bacteria or viruses. They are ‘scaled up’ into marketable products using biological processes or biotechnology.

Genentech developed the first approved biopharmaceutical, Humulin, manufactured and marketed by Eli Lilly, as a biosynthetic human insulin made using recombinant DNA technology. Other products include Abbott’s Humira, based on an anti-TNF antibody, for rheumatoid arthritis, and Roche’s Herceptin for the treatment of breast cancer.

One of the most advanced approaches to biopharmaceuticals is that of Kymab, founded in 2009, which is using Kymouse™, a transgenic mouse that has been designed to produce a diverse range of human antibodies as potential new drugs.

ALTERNATIVE IN VITRO AND IN VIVO MODELS

Biologists have traditionally used a range of in vitro assays to assess the potential efficacy and toxicity of new drug candidates. Primary cell lines derived from normal human tissues, as well as human stem cells, are being increasingly used to provide more informative data.
Indeed stem cells, with their ability to continuously renew themselves, and to develop into any of the cell types in the body, are an invaluable tool for not only evaluating potential new drugs, but for gaining a greater understanding of disease mechanisms. They are already used in bone marrow transplantation, but have the potential to treat a range of diseases.

Nor are things stopping there. For example, new advances in biotechnology by the Institute of Food Research and Plant Biosciences Limited, with funding from the Biotechnology and Biological Sciences Research Council (BBSRC) are leading to the development of a ‘Dynamic Gastric Model’ (BBSRC 2013): a computer-controlled, mechanical simulator of gastric digestion that processes real food, oral pharmaceutical and nutraceutical products (nutritional products with therapeutic benefits). This new in vitro tool will provide information on the interactions between the food we eat and liquids that we drink (such as alcohol) and the drugs that we take.

FROM SINGLE DRUG TARGETS TO STRATIFIED MEDICINES AND THE ROLE OF BIOMARKERS

There is a growing focus on stratified or personalised medicine: the concept that appropriate medicines, and doses, can be targeted to individuals, or as is more likely at this stage, sub-groups of the population based on their genetic profile.

For example, companies like Horizon Discovery have developed tools such as GENESIS™ to create human cell lines or ‘patients-in-a-test-tube’ that can be used to predict which patient sub-groups will respond to which drugs.

Professor Paul Workman of the Institute of Cancer Research comments:

The science is taking us in the opposite direction to blockbuster drugs, to personalised medicine. You would identify the patient who would benefit from what drug according to a gene test. A relatively small number of patients will benefit but they will benefit extremely well.

Biomarkers are traceable substances that, when used in living cells or tissue, either in isolation or within a whole organism, can provide information on the effect of a drug, the state of a cell, tissue or organ, or the progression of a disease. Biomarkers can be synthetic compounds, natural proteins, genetic material or indeed any other kind of chemical or biochemical material.
According to Michel Goldman, Executive Director of the Innovative Medicines Initiative (IMI):

*The key to pharma is personalised medicine with the development of biomarkers and the stratification of patients. To validate novel tools and convince regulators that a set of biomarkers might be useful to patients you need a very strong bioinformatics and KM approach. Also in eHealth, to manage the data coming from different sources, standards are needed: you need very skilled scientists in KM.*

**CHANGES IN THE NATURE OF MANUFACTURE AND IN THE SUPPLY CHAIN FOR MANUFACTURING**

The effect of the changes we have described for Manufacturing goes back to the Development phase where, as we describe further in Chapter 5, the shortening of development lead times and the need for a smooth transition into full-scale manufacture require increased collaboration and a greater flow of knowledge.

The other area in which there has been a significant shift is that of supply chain complexity. We have already mentioned the diversification of the product range in response to the challenge from generics, which results in a greater number of finished packs being marketed. This, combined with more sophisticated product delivery from Development, and more complicated sourcing due to the in-licensing of products, the out-sourcing of raw materials and the need for specialised components, all contribute to a highly complex path from raw material to finished goods. Meanwhile, there has been immense pressure on Manufacturing to reduce costs to compensate for falls in revenue from products going off patent and fewer new products to replace them. Amongst these changes there is also the need to maintain regulatory compliance throughout the supply chain, a constant challenge with the increased pace of change.

**The Knowledge Management Framework in the Context of the Pharmaceutical Industry**

Knowledge is generally considered as ‘the other product’ from the Pharmaceutical Industry. It is both the output and the input for the successive steps in the value chain. It has many facets, from providing comprehensive knowledge bases for the technicians, scientists, clinicians and various business services supporting the chain, through the sharing of advice and problem solving, to providing an environment for innovation and change.
A HISTORICAL PERSPECTIVE

According to a 2008 * PharmaManufacturing* editorial by Doug Bartholomew (Bartholomew 2008), most pharmaceutical companies are using technology and processes to capture and share knowledge in R&D and Manufacturing. Bartholomew suggests that a good Knowledge Management approach makes use of Document Management systems and collaborative tools to foster the sharing of ideas, experience and knowledge. The article cites AstraZeneca’s International Biology Information System (IBIS) and Baxter International’s Global Information Platform (GIP) as examples of the Knowledge Management systems used within the industry. It also cites SharePoint as an information-sharing platform to foster teamwork within the company, and its MySite feature to provide a Facebook-like online community.

Knowledge Management has also been an integral component of Bristol-Myers Squibb’s way of working even before 2001 (Leavit n.d.), when Melinda Bickerstaff was appointed to lead a more formal approach to KM for R&D and the enterprise as a whole. ‘Just no one labeled it that’ as Bickerstaff quoted in an APQC article on the role of KM in new drug development. Their KM strategy combined the provision of integrated information products and services and training in their use, active knowledge capture and retention initiatives to coincide with the acquisition of DuPont Pharmaceuticals, creation of a lessons learned process, and development of a web-based portal for both published and internal information. The portal also acted as a vehicle for the creation of CoPs.

Bawden and Orna (2001) suggested that knowledge is required for three key objectives in a research-based pharmaceutical organisation:

- to identify new compounds for exploratory research;
- to determine which compounds have appropriate safety and efficacy;
- to bring the compounds to registration.

As the scope of this book extends beyond R&D, we would suggest an additional objective:

- to bring the new drug to the market, ensure regulatory compliance and maintain its competitive advantage.
Bawden and Orna see Knowledge Management as an extension of information management, dealing with ‘knowing how’, ‘knowing who’ and ‘knowing why’. An adapted version of their list of the general areas of knowledge that are required in this context would include:

- Internal knowledge such as: a company’s past and current research; its critical success factors for evaluating proposals and ongoing projects; developments in methods and technologies.

- External knowledge such as: regulatory requirements and legislation; the status of the health service and the Pharmaceutical Industry and its markets; customers; suppliers; developments in science, methods and technologies; competitors and their products; the social and economic environment.

OUR INTERVIEWEES’ PERSPECTIVE

When we asked our interviewees about their experiences of and insights about Knowledge Management in the Pharmaceutical Industry, they tended to focus on two main types of knowledge: data and other forms of tangible or ‘explicit’ records (what we describe as ‘content’ in our framework), and people.

Whilst KM capability – or the roles played by individuals and functions within the organisation to promote and support Knowledge Management practices – did come up in our conversations with the interviewees, it perhaps has a less visible or centralised role in pharma today than it did back in the 1990s when it fell to IT, HR, Information Management or some other central Business Strategy department, maybe even a KM group, to drive it. This probably reflects a maturity in KM compared to 10–15 years ago, that is, that it is embedded to a large extent as a way of working; that the ‘novelty factor’ has worn off so that fewer organisations are paying attention to it; or that it has become more fragmented; more targeted. The answer may well be a combination of all three – with a challenging business environment and changing working practices such as increased flexible working, greater collaboration and more sophisticated technology, all contributing to this outcome. This is a theme that we come back to in Chapter 8.

Our interviewees also mentioned the importance and role of measurement frameworks and KPIs, and this something that we explore further in later chapters.
Last but not least, our KM Framework describes the importance of relating Knowledge Management strategies to the overall business goal. Whilst the case studies in the next few chapters of the book provide a lot more detail on how our KM Framework applies to the industry, we will give a more general illustration here, starting with business goals and Knowledge Management strategy.

THE PHARMACEUTICAL GOAL – OR VISION – AND KNOWLEDGE MANAGEMENT STRATEGY

Sandra Ward’s experience with Knowledge Management started following the Glaxo Wellcome (GW) merger in 1996. One of the key goals of the new organisation was to build a Learning Organisation to realise the potential of ‘our people, resources, technology, information and capital’. This goal and discussions with leaders of post-merger redesign projects in GW Research and Development stimulated the R&D Knowledge Network project that would deliver an enabling framework of work practices, processes, critical content, technical infrastructure, tools and competencies to support process redesign and business improvement initiatives. The enablers would accelerate the location of and connection with experts; the re-use of documented knowledge; reduce the risk of duplicative work; and foster idea creation and collaboration. The focus included:

- knowledge-sharing competences and techniques;
- location of resources – the top 100 R&D knowledge assets;
- standards to simplify information publication and location (metadata, thesaurus, a single search engine, and publishing and alerting tools);
- training in collaborative working.

Benefits management underpinned all implementation streams to ensure that each delivered the planned business value.

(The terminology GW R&D used for the Knowledge Network illustrates the ongoing tension between the use of the terms ‘information’ and ‘knowledge’ and how many people inter-mix them.) In this example, the CEO’s clear organisational goal enabled Sandra and her colleagues to pursue a Knowledge Management project, which in turn led to a number of related initiatives.
A review of a few pharmaceutical companies’ current business goals, as presented on the internet, provides some interesting insights on where Knowledge Management strategies might sit today. Not all of them explicitly mention Knowledge Management, or even the word ‘knowledge’, but some of them do so quite graphically.

One of Pfizer’s ‘commitments for a healthier world’ (Pfizer 2009) clearly emphasises the sharing of knowledge to address diseases:

Because answers to some of the most preventable health issues of our time are within reach, we will bring the best scientific minds together to challenge the most feared diseases of our time and as demonstration of this commitment, we will …

- Collaborate with others and share knowledge.
- Focus unparalleled scientific and financial resources on continued discovery, development, and, delivery of medicines that people need.
- Fight aggressively against Alzheimer’s disease and cancer

Merck’s (Merck n.d.) value on diversity and teamwork emphasises knowledge as a core capability:

Our ability to excel depends on the integrity, knowledge, imagination, skill, diversity and teamwork of our employees

Whilst the section of UCB’s (UCB n.d.) vision that deals with ‘Connecting People’ (the other two sections focus on Connecting Science, and Connecting Patients) is perhaps the boldest acknowledgement of the value of the knowledge that comes from its people, and the importance of providing human and Information Technology-related opportunities to share it:

In a knowledge- and ideas-based industry like ours, human capital is the lifeblood of success. To unlock the creative potential of our global team of 9,000 staff and our partners, we are creating a networked, cross-functional organisation.

- multi-disciplinary teams are working on all development projects, including members of R&D, supply chain and sales, as well as partners and patients.
• UCB People, an innovative intranet tool, links our knowledge and skills. Our virtual R&D collaboration platform, based on the principles of Wikipedia, is another example.

Even if they do not mention knowledge explicitly, the goal, or vision, of pharmaceutical companies today is all about knowledge sharing, and innovation and coaching plays a key role in supporting this.

**KNOWLEDGE MANAGEMENT TOOLS, PROCESSES AND TECHNOLOGY**

There are many ‘touch-points’ for knowledge along the value chain. In our KM Framework that we described in Chapter 1, we referred to ‘Knowledge Transfer’ as a type of KM process. We will use examples of Knowledge Transfer to describe a few of these ‘touch-points’ in the value chain as shown in Figure 3.2.

**Sequential Knowledge Transfer along the value chain**

**Knowledge Transfer within individual functions**

**Knowledge transfer to support the business**

- e.g. Competitive Intelligence, Interaction with Consumers etc.

**Multifocal Knowledge Transfer to support key processes**

- e.g. Project Management, Safety Risk Management etc.

Figure 3.2 Knowledge inputs and outputs to the pharmaceutical value chain

*Sequential Knowledge Transfer along the value chain*

With knowledge being ‘the other product’ from the Pharmaceutical Industry, the ability to pass it along from one step in the value chain to the next is crucial. Some ways to achieve this are to have:

• project teams and ‘stage gate’ review meetings;
• well-structured Document Management systems for streamlined compilation of regulatory submissions;

• ‘open access’ policies so that people throughout the organisation have access to the information held within repositories.

As project team members can come from all parts of the organisation, projects are also an example of ‘multifocal’ Knowledge Transfer, that is, where knowledge can come from and go to any functional department in the organisation in order to support a common aim, rather than flowing sequentially from one point to the next. We talk more about the role of project teams in this approach below.

Document management systems facilitate the streamlined production of regulatory submissions, for example through pre-populated contents pages that ‘drive’ or ‘pull’ in the collection of the necessary constituent document. They also usually include pre-defined standards and templates that ensure that the format of documents is ‘right first time’. The design of these systems reflects the experience and insights (the ‘know-how’) of those involved in what works best to meet the requirements of the Regulatory Authorities.

The actual degree of open access adopted by an organisation to the information held in its Document Management systems may be something that has to be negotiated in relation to any perceived regulatory or competitive risk. In Stephen Clulow’s experience, the value of ‘open access’ is something that people recognised over time as they saw the resultant dramatic increase in the level of collaboration between departments, generally improved communication and smoother transition between the Research, Development and Manufacturing departments involved. He has witnessed savings of between two weeks and two months in the transition between research and development as a result of open access policies.

Effective Knowledge Transfer along the value chain is also integral to its efficient functioning. An example where John Riddell was involved in resolving issues with the transfer of manufacturing from one location to another is described in Chapter 5.

**Multifocal Knowledge Transfer to support key processes in pharma**

There are some processes within pharma which are either intrinsic to its way of working, as in the case of Project Management, or that deliver key information
through the lifecycle of a drug, as in the case of Safety Risk Management. These are examples of ‘multifocal’ Knowledge Transfer in that the knowledge flows into and out of these activities from multiple parts of the organisational structure at the same time, rather than in a more sequential path along the value chain.

Project Management encompasses both technical Knowledge Management (scientific, clinical, manufacturing knowledge) and procedural Knowledge Management (the ‘nuts and bolts’ of managing a project in this environment). The most effective projects tap into what knowledge is already available when they start-up, access and share knowledge while they are in progress, and review what they have learnt for wider sharing when they are complete: essentially the ‘Learn Before, Learn During, Learn After’ that we describe in Chapter 1. This exchange of knowledge occurs between all the pharmaceutical departments represented on the project and their counterparts in organisations with which they are collaborating. We explore case studies of Knowledge Management in Project Management in Chapter 4.

According to Mark Perrott, Safety Risk Management is one of the big challenges for pharma over the next few years given the scope and reach of this for all the departments involved within organisations, and as the regulations continue to evolve. Mark wrote an internal paper based on his experience in this field that went into substantial depth on this subject. Some of the key implications for Knowledge Management are:

- the importance of proactively identifying, documenting and communicating risk information through every stage of R&D and through to post-approval, as opposed to the previous reactive approach for doing so only from the point of regulatory submissions;
- the need for an effective process which enables the consolidation of safety risks and related risk management actions and effective decision making at a senior level both within R&D and in the commercial functions;
- strong integration (information, documents, processes and general knowledge sharing) between all the team players involved in risk management be they clinical, pharmacovigilance, manufacturing or others.
Knowledge transfer within individual functions

Each function, discipline or step with the pharmaceutical value chain must find ways to manage its version of the Knowledge Cycle that we described in Chapter 1. A huge amount of internal and external (or published) data and information, expertise and insights needs to be managed and utilised to derive timely and well-informed new insights and decisions.

Accessing, making sense of, and managing clinical trial data are examples of some of the large Knowledge Management challenges faced by the Pharmaceutical Industry. Any initiative that can help trawl through the vast amounts of data involved and cut down on the consequent amount of time and money for trials is going to be very welcome. The IMI (IMI n.d.) is a joint European Union and European Federation of Pharmaceutical Industries and Associations (EFPIA) public–private initiative that has been set up to speed up the development of better and safer medicines for patients, by addressing these kinds of Knowledge Management challenges. Michel Goldman describes one such initiative by IMI:

One example, which clearly illustrates the added value of public–private partnership for industry and for society is where the NEWMEDS project assembled the largest database ever on schizophrenic patients involved in clinical trials. There were more than 60 clinical trials, more than 20,000 patients and possibly nine different Pharmaceutical companies.

What the project realized by doing a meta-analysis of the data was that a four-week observation, rather than the usual six-week observation, could be enough to predict the efficacy of the drug. They also realized that it was possible to reduce the number of patients in the trial. So this was a spectacular example showing that by working together, pooling data, organising Knowledge Management on a large scale it’s possible to obtain very important data not only for organisations but also for patients.

Knowledge transfer to support the business

Some kinds of insights are needed across the whole of the value chain. Competitive Intelligence is a case in point. According to Tony Murabito, the ability to monitor what your competitors are doing, what they stopped doing and feed that into all aspects of a pharmaceutical organisation’s work,
has always lent itself to Knowledge Management techniques. He describes a ‘technology’ project at Cubist Pharmaceuticals that helped to connect the entire organisation by providing news stories, business reports and alerts on competitors, therapeutic areas of interest, and new research. The entire organisation was asked to provide trip reports from meetings, snippets from investigators and copies of posters that they had seen. According to Tony:

This is one way to engage and involve the entire organisation and share knowledge and information and give it back to them in a valuable format – which is the important part: how to make it valuable for everyone.

However, the value of Knowledge Management is not limited to just within an organisation. Tony Murabito also describes an example at another company (Human Genome Sciences – HGS) of its application to the interface between a company and consumers in the case of Lupus, a very debilitating disease which manifests itself in fatigue, bone pain, terrible rashes, hair loss and at the latter more serious end stage renal cell failure and liver failure. It is very expensive and difficult to diagnose and there had been no new drugs approved by any regulatory agency in over 50 years prior to HGS’s drug Benlysta™. So HGS investigated how it could bring experts, disease advocates and user communities together to share stories and approaches, and how to do that in the context of regulatory compliance and meeting the various regulations on communications between companies, practitioners and patients. Social media, still in its infancy but unbelievably powerful, is a tool for facilitating this kind of interaction between all the players. It is a new vehicle for communication and dialogue just starting to get some attention from the regulators. It is a subject we come back to in Chapter 8.

CONTENT, TECHNOLOGY AND PEOPLE

Given the vast amount of data generated internally by pharmaceutical companies (sometimes referred to as ‘Big Data’), many Knowledge Management practitioners believe that the value they bring to the industry is in helping organisations to ‘mine’ the data, combine internal with external data (as in the work of the European Bioinformatics Institute (EBI)) and re-use it to answer important questions, enable decision making and facilitate collaboration within an increasingly fragmented market. We explore more examples in this area in later chapters, but here are a few to get us started.

We have already mentioned Document Management systems in this chapter, and record or Document Management is central to all organisations’
management of their legacy in-house information as a potential source of new knowledge. The most basic application of Document Management is that every project and function has its own assigned online folder, with a common folder structure, especially at the top levels, to facilitate navigation by people who are working across multiple areas. Companies initially held this information on internal servers then migrated to Documentum, which, alongside SharePoint, continues to be a key technology for records management today.

Controlled vocabularies and standardisation facilitate retrieval of legacy information and hence the potential creation of new knowledge. Many organisations have sought to address this in-house over the years, but it is also an issue for sharing data and information across organisations, especially as the industry becomes increasingly fragmented.

Ann Martin has a Knowledge Management role across IMI, and so has an oversight of many of the projects that IMI supports. She witnessed the early development and eventual implementation of the Clinical Data Interchange Standards Consortium (CDISC) data format and content standards for clinical trials across the industry. It all started with the CEO of a small virtual company, Rebecca Kush, who, with the support of the FDA and a number of enthusiastic pharma professionals, started collaborating to define data content standards. Now that the standards are in place, there is still a different degree of implementation from one company to another, but the fact that all companies have adopted the standards to some extent has made a huge difference to their ability to share data in a more streamlined way, and so extrapolate information and new knowledge from it.

2 The CDISC standards have been accepted for the obligatory data submissions as part of a marketing authorization application in the US (Center for Drug Evaluation Research (CDER) since 2004 and the Center for Biologicals Evaluation Research (CBER) since 2010. In the European Union, Patient Data Listings are part of the Clinical Study Report under section 16.2 and are proposed to be made available to the public under a controlled access. A draft guideline to this effect has been issued by EMEA on 24 June 2013 and refers to the CDISC in section 4.2 Data Standards.

3 Companies have implemented the standards as part of good business practice and for the purpose of regulatory submissions. Yet, as discussed in the CDER Common Data Standards Issues Document (version 1.1/December 2011), there have been varying degrees of implementation.

4 The use of standards does not only allow data to be shared with outside partners but also to streamline the analysis of the data and faster generation of the mandatory Summary of Clinical Safety and Summary of Clinical Efficacy in 2.7 Clinical Summary of a product registration dossier. The standard formats of the data and documents also allow faster assessment of molecules during in-licensing and out-licensing activities.
Intranets and associated search tools are very much at the core of so-called Knowledge Management technology tools today. An early experience of the successful application of intranets was to base the navigation and categorisation of information held within them on what people wanted to do, for example recruiting, accessing antibodies externally and so on rather than by organisational structure. At the same time, search tools evolved within the industry to Google-like interfaces, so that people could carry out simple searches with the option of doing more advanced ones.

We talk further about the use of social networking tools as a way of connecting people in Chapter 8 in particular, but here is an example of one of the earliest applications that we have come across, also described by Stephen Clulow:

When scientists were part of a global organisation they did not know what everyone else was doing: the roles and responsibilities of certain groups; what knowledge, skills and capabilities they had; or what exciting and innovative science they were doing. So we used WIKI software to create a social networking site for scientists – this enabled everyone to share what they were doing, what they found interesting and it enabled them to collaborate (globally) to solve scientific challenges.

Tony Murabito builds on the theme of how to connect people in saying that the importance and relevance of Knowledge Management to pharma is in leveraging the technology in ways that were not possible even five years ago. HGS set up Town Hall meetings for Lupus, using newspaper supplements (USA Today, Washington Post, Chicago Tribune and others) and webcasts to highlight patients sharing their experiences, different therapeutic programmes they had been on, how they were dealing with the disease, side effects and getting back to living a semi-normal life, interacting with each other and with healthcare practitioners who were available to answer questions (managed in a way that was compliant with regulations). In Tony’s view, these types of initiatives are going to become more and more critical as sources of knowledge to support scientific and medical advances.

**KNOWLEDGE MANAGEMENT CAPABILITY**

In the early days of introducing Knowledge Management as a strategic initiative within pharmaceutical organisations, which functional group took it on depended on how it was perceived: as technology (IT), information (Information Management or Libraries), learning (Human Resources),
pure strategy (Business Strategy), or as a distinct entity to be managed by a centralised group (Knowledge Management, OE and so on).

According to Stephanie North, knowing where to place KM in the organisation can be a key problem in itself. Her experience is that it can often end up in the IT department because people associate knowledge with tools, rather than with the knowledge itself. However, as she points out, this can be a risk where organisations are cutting back, when aspects of IT can be the first to go, with activities relating to knowledge being outsourced, and the consequent loss of knowledge workers. As Stephanie goes on to say:

"Pressure on IT to simplify, cutting back on the number of people involved (in IT and elsewhere in organisation) and focus on tools and applications rather than collaboration and the knowledge itself may also mitigate against the breadth and depth needed for effective KM."

We mentioned earlier that the model for KM capability has been evolving in various ways, and one way that it has done so is to become integrated within other organisational disciplines – something that is generally a good thing from a business perspective. This situation can work well in smaller organisations where people will talk more to each other across disciplines and will also have multiple roles thereby fostering knowledge sharing. In larger organisations, it may result in the creation of knowledge silos.

However, a centrally placed KM group is also likely to struggle with sufficient reach across a large organisation. This can be mitigated by appointing and training local ‘change agents’ to promote and facilitate KM at a local level. We mentioned in Chapter 1 that a ‘change agent’ or ‘Knowledge Manager’ at each location supported the GSK Manufacturing Central Team. They were trained by the Central Team in the tools and processes and became an integral part of the strategy implementation. All bar a few carried out this role alongside other responsibilities, and although KM sometimes suffered from a lack of prioritisation by local management, on the whole the Knowledge Managers made a massive and critical contribution to the programme.

We look further at the role of the supporting capability for the KM strategy in Chapter 7, when we look at the enabling activities that are required for successful Knowledge Management.

Lastly, Stephanie North suggests that it may be worth considering the role of Alliance Managers in organisations in relation to KM because they have to
manage relationships for collaboration with other organisations and oversee legal and other key data/information/knowledge exchanges involved in the implementation of these collaborations.

The Impact of the Changing Pharmaceutical Business Model on Knowledge Management

The evolution of the pharmaceutical business model has affected and will continue to affect the nature of the content and players in Knowledge Management. John Trigg suggests that it may be more than just a question of dealing with productivity issues, and that what the industry might experience may be in fact be ‘game changing’.

*There are potentially enormous opportunities with personalized medicine, moving away from the traditional ‘blockbuster drug’ model and targeting specific diseases and conditions, akin to ‘The Long Tail’ (Chris Anderson) – like the models adopted by Amazon and iTunes: stocking one of everything rather than large volumes of fewer items (a case of breaking the 80:20 rule).*

Quite how far-reaching these changes will be is something that we may only fully realise in retrospect, some years from now.

**ECONOMIC AND BUSINESS CHALLENGES**

As we mentioned in the introduction to this chapter, there are significant economic and business challenges for pharmaceutical companies. These include, but are not limited to, decreasing income due to patent expiry and a dwindling number of New Chemical Entities (NCEs).

The western world is also being affected by the shift in global economic centres to the BRIC countries (Brazil, Russia, India and China). To illustrate this, Cambridge Consultant’s report from a recent workshop, ‘India: Driving World Pharmaceuticals by 2030?’ (Cambridge Consultants 2013), describes how India’s Pharmaceutical Industry turnover has grown from $300 million in 1980 to more than $22 billion today and it is expected to continue to grow to $55 billion by 2020.

At the same time, as Sandra Ward says, there are huge pressures on R&D costs in companies as well as the changing shape of companies with more
operational activities being outsourced and innovation being in-sourced, even in R&D. She mentions a December 2011 McKinsey report (Hunt, Manson and Morgan 2011) about the challenges being faced by ‘Big Pharma’:

'It uses terms like ‘disaggregation of the value chain’. And that shows that there’s a huge inherent knowledge challenge that you have to get right. If you’re going to outsource, you have to be able to retain the expertise in-house to be able to manage that outsourcing. If you’re going to in-source some of your new chemical entities, the process of assessment has got to fit into your R&D strategy. Essentially, these are knowledge-based activities.'

Sandra Ward has direct experience of how Knowledge Management can come into play in out-licensing from working with one pharmaceutical company to help them engage partners. Conferences were the place where potential partners would reveal themselves through their R&D presentations, where knowledge of competitors could be deepened, and where corporate attendees needed to work as a team whilst scattering to pick up intelligence. The starting point was a consistent knowledge base of information on the compound that they wanted to out-licence. Armed with this the R&D staff could attend major conferences confident that they were up to date on all aspects of the compound. They exchanged daily updates with one another and with a home-based knowledge co-ordinator, charged with building up the knowledge gleaned on potential partners and competitors and ensuring that everyone could access it. This was used to help the company decide who their out-licence partner would be. As Sandra says:

'The whole in-licensing, out-licensing, working with partners has huge knowledge issues: sharing knowledge bases, securing knowledge bases, a form of managing Intellectual Capital wisely. Competitor intelligence is a key KM activity.'

CHANGES IN STRATEGY AND ORGANISATIONAL STRUCTURE

Mergers and acquisitions, downsizing, moving to other geographical areas, outsourcing, the growth of biotechs and Contract Research Organisations (CROs) and collaborative models including ‘Open Innovation’ are further examples of the changes that the industry is undergoing.

In March 2013, AstraZeneca, Britain’s second largest pharmaceutical company, announced that all of its research and development in the northwest
of England will cease by 2016, with the loss or relocation of more than 2,000 jobs, effectively cutting more than a tenth of its UK workforce, and much of the relocation being to a new centre in Cambridge, UK. The US Company, Pfizer, did something similar not long before that, closing its science park in Sandwich, Kent, and shedding 1,500 jobs. GlaxoSmithKline, the UK’s largest pharmaceutical company, has been working on its business model for about ten years, reorganising its R&D into smaller and smaller units, and again, shedding many jobs in the process.

Fragmentation and changes in organisational structure have huge implications for Knowledge Retention. As Stephen Clulow explains:

*The KM roles that have been traditional drivers of Knowledge Management are those that tend to be viewed as peripheral and are being lost. There is less KM capability, and also greater pressures on time so that recording knowledge for posterity such as through exit interviews and After Action Reviews can suffer.*

At the same time, as Janette Thomas (an independent project manager who facilitates cross-organisational projects between small biotech start-ups, academia, health and pharmaceutical organisations) points out, there are lots of people coming out of pharmaceutical companies with the expertise and experience that enable them to fluidly come together and work as a team. However, as she also points out, this fragmentation poses greater challenges to those involved, having to work across different countries and cultures, and with every company having their own way of doing things.

This fragmentation of the industry, and the continued pressure on people from the efforts involved in streamlining the organisation and its processes, make it much harder to embed Knowledge Management practices. People cannot give the time and attention that are needed to facilitate and support the behavioural changes involved. We come back to this topic in Chapter 7.

Stephen Clulow also believes it is increasingly important to get Knowledge Transfer in place both in terms of what organisations already know and in how to manage the knowledge in partner relationships, with CROs, outsourcing, with collaborators and in joint ventures. He suggests that this Knowledge Transfer is also important because it will lead to innovation, something that the industry needs, not just to innovate its products but also its business models.
Finally, as Jackie Hunter says:

*The effect of managing multiple collaborations in multiple companies creates challenges for KM. As companies work together more pre-competitively, understanding what is only within the company, what is only within a particular collaboration and what can be freely shared will be more and more important.*

**THE EMERGENCE OF CROSS-ORGANISATION ‘COMMUNITIES OF INTEREST’**

In this more fragmented landscape, cross-organisation networking groups also have a valuable role to play in providing opportunities for their members to draw on and learn from expertise that would have been integral to larger organisations of which they might previously have been members. John Larkin is a partner at TPP, a small strategy and advisory firm. He set up the Biotech Speciality Pharma Forum (BSP) in 2006 as a cross-company networking group for people from IT functions. He says:

*Although participation has changed over the years, the core group (Boston Biotechs) has stayed the same.*

*The group is not trying to be a Gartner or other big research organisation. Such groups bring research to the table and are targeted mostly at CIOs with money attending one-off events.*

*Instead, this group is aimed at smaller companies who lack the internal peer group usual to big companies. The theory they work on is that ‘constructive peer pressure is a good thing’. Members therefore include relatively small companies (for example, Vertex, Sunovion, Cubist, Human Genome Sciences, Synageva) and are described as being from ‘the office of the CIO’ so that the CIO’s direct reports can also participate.*

Janette Thomas has formed her own independent group of people to share information with – so it is her own management system in a way: a database of people. But more formally she is a member of the Pharmaceutical Information Project Management Group – PIPMG. It covers pharma and biotech project managers. They have meetings twice a year, have speakers and networking opportunities, and enable the sharing of common interests and Best Practices.
At the other end of the scale, One Nucleus (One Nucleus n.d.), based in the UK but including members from the US, other European countries, Australia and others amongst its network of 470 plus organisations, is one of the largest Life Sciences and healthcare companies networking groups. Its members range from the large global pharmaceutical companies to small biotech start-ups of less than ten people. Its regular events are valuable opportunities for its member organisations to hear about the latest developments in this sector and to explore opportunities to partner with each other.

Conclusion

The nature of the Pharmaceutical Industry value chain, and the entire model on which it is based, is evolving rapidly under the combined influence of scientific and technological breakthroughs, and economic and business pressures. Whether these changes will be purely evolutionary, or more fundamentally ‘game changing’, is something that only time will tell. In the meantime, Tony Murabito provides some useful closing thoughts:

Health care is changing and it’s going to be more about health prevention and how to keep people well instead of just curing them; what are the best practices, good nutrition, environmental issues and so on. Social media and Knowledge Management are going to lend themselves to that more and more. That’s the only way we’re going to get a handle on health care cost and be able to manage a growing and aging population.