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Introducing a Model and a Framework to Unify the Pharmaceutical Quality System Enablers Quality Risk Management & Knowledge Management

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COVER SHEET

Title:

Introducing a Model and a Framework to Unify the Pharmaceutical Quality System Enablers Quality Risk Management & Knowledge Management

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Abstract

An organization that effectively manages knowledge should be able to recognize and proactively apply new learnings to better anticipate risks. This is particularly important in the manufacture of medicinal products. Since the publication of ICH Q10 in 2010, Quality Risk Management (QRM) and Knowledge Management (KM) have been positioned as co-enablers to the Pharmaceutical Quality System. The authors of this paper present a *Knowledge Management process model* to foster greater practical understanding of the practice of knowledge management. This model when joined with the familiar ICH Q9 process model for QRM, should enable a company to better manage their knowledge and risk. In addition, a framework, the *Risk-Knowledge Infinity Cycle* is presented to better link these two disciplines at large and specifically as the dual enablers to ICH Q10. It is the authors belief that treating QRM and KM in this way will have a variety of potential benefits for biopharmaceutical companies, including improved risk-based decision making, facilitating evidence-based risk reduction and increased process knowledge, leading to less uncertainty and subjectivity in QRM outputs. This should ultimately result in more effective risk-based control strategies and more reliable manufacturing processes, which potentially lead to increased protection - and other benefits including product availability and value - for patients. This paper presents the *Knowledge Management process model*, and the *Risk-Knowledge Infinity Cycle* and an example of the application of the *Risk-Knowledge Infinity Cycle*.

1. Introduction

Since the introduction of ICH Q10 [1], the two enablers to the Pharmaceutical Quality System (PQS) being Quality Risk Management (QRM) and Knowledge Management (KM) have been treated as distinct and largely disconnected from each other in research and in practice.

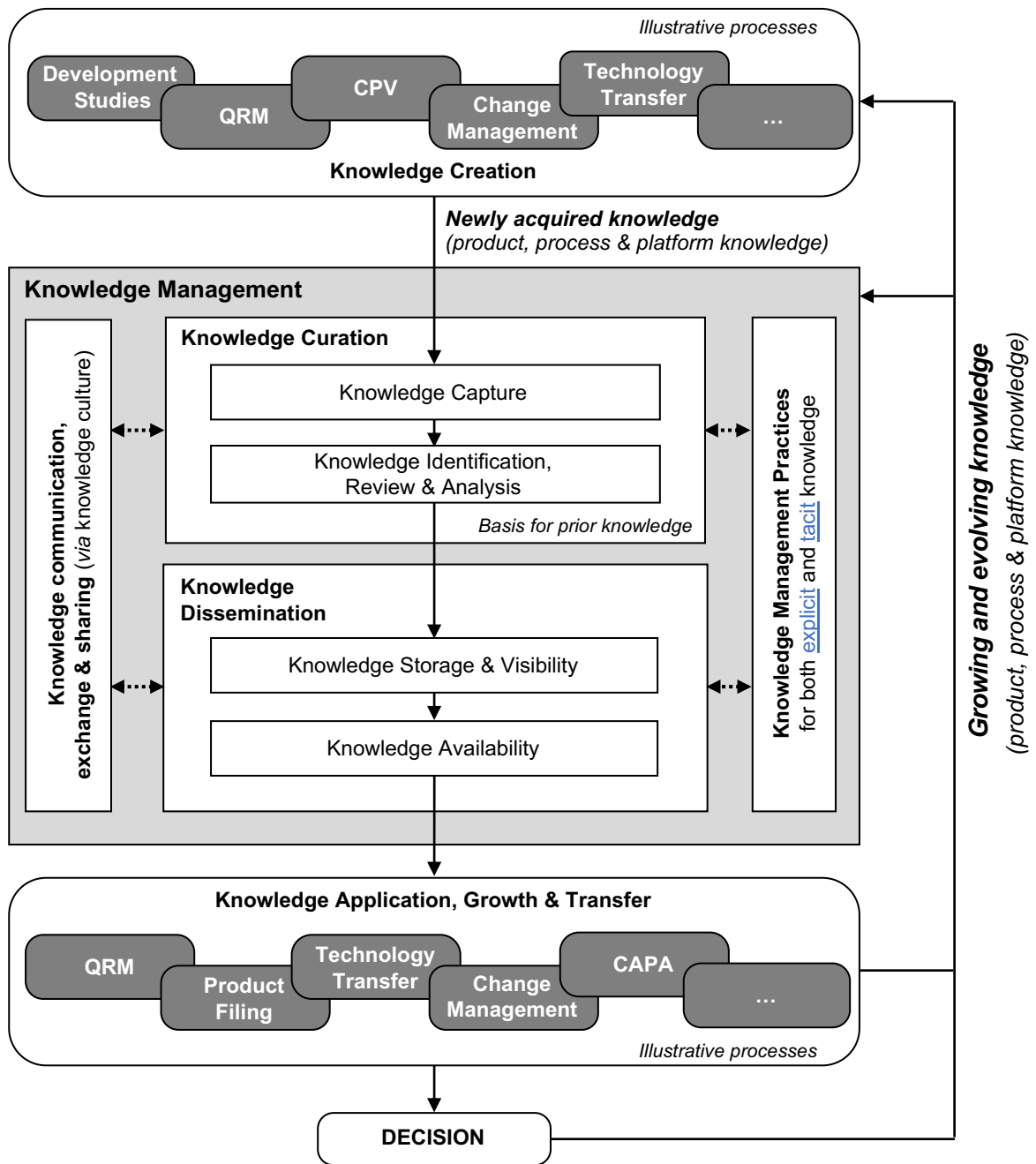
As part of a research effort by Lipa, O'Donnell and Greene, a key focus has been to unify QRM and KM in support of a more effective PQS and ultimately enhancing protection of the patient through improved quality risk management outcomes. This research included a detailed literature review of how other industries link knowledge management and risk management, as well as an examination of the regulatory guidance on managing knowledge and risk relevant to the biopharmaceutical industry [2].

The purpose of this paper is to provide an introduction to a model to enhance the practical understanding of KM in the manner which QRM benefits from the process model depicted in ICH Q9 [3]. This model is presented as the *Knowledge Management process model*. Subsequently, a framework to better describe the link between KM and QRM is presented, the *Risk-Knowledge Infinity Cycle*. Further detail on both this model and framework will be the subject of a subsequent publication in the Institute of Validation Technology [4] and Level3, a Technological University Dublin publication [5].

2. Knowledge Management Process Model

A *Knowledge Management process model*, which illustrates the role of KM in how an organization can manage its knowledge as an asset, is proposed by the authors and is presented here in (Figure 1).

The model can be viewed as a KM analogue to the QRM process model presented in ICH Q9 [3]. It encompasses the rather narrow definition of KM proposed by ICH Q10, being “a systematic approach to acquiring, analysing, storing, and disseminating information related to products, manufacturing processes and components,” and further enhances this definition by highlighting the need for knowledge to flow in to KM from various processes and to subsequently be applied to various processes in support of decisions or other objectives. The model also features the need for KM practices to facilitate the management of both explicit and tacit knowledge, and channels for knowledge communication, exchange and sharing supported by a *knowledge culture*.



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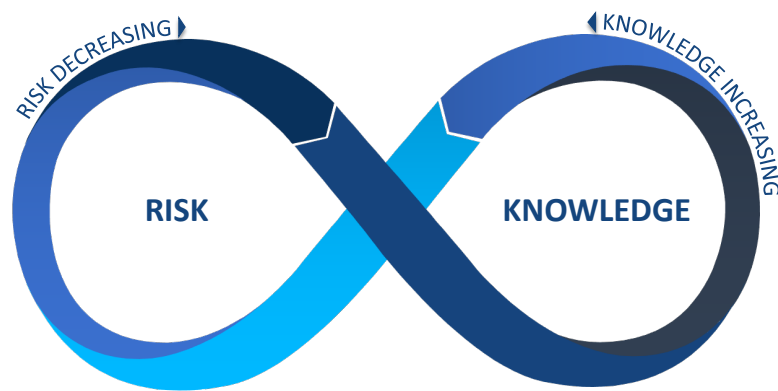
(CPV = continuing process verification | CAPA = Corrective Actions Preventative Actions)

Figure 1 – Knowledge Management process model

There are several important features to this model which have the opportunity to better define how KM can be practically applied. These features will be discussed in subsequent publications as previously detailed.

3. Risk-Knowledge Infinity Cycle

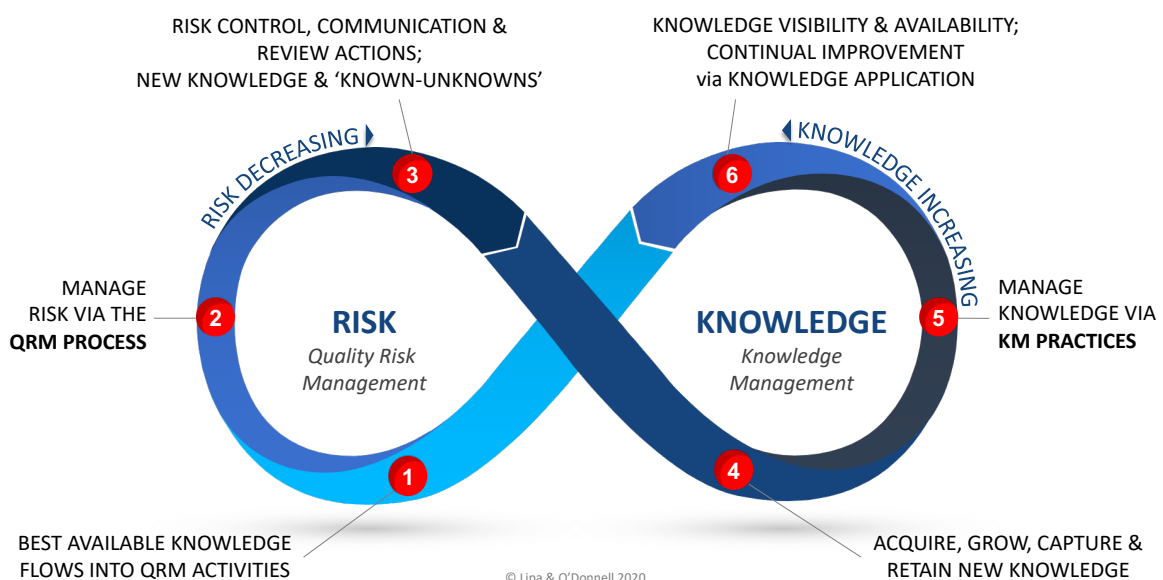
Building on the detailed literature review and the two concepts established in a previously published paper by the authors in the *Journal of Validation Technology* [2], a simple framework was developed to link Risk and Knowledge. The first underlying concept is that knowledge in both an input and an output to risk management [2]. The second concept is that knowledge has an inverse relationship with risk, such that the more knowledge one has, the less uncertainty and therefore, the less risk [2, 6]. This proposed simple framework, entitled the *Risk-Knowledge Infinity Cycle* is presented in Figure 2, and provides a visualization of how risk and knowledge are connected.



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Figure 2 – The Risk-Knowledge Infinity Cycle

In order to present an example of the application of this *Risk-Knowledge Infinity Cycle*, the authors applied the framework to ICH Q10, as illustrated in Figure 3, which depicts the how QRM and KM become related in *maximizing* the knowledge available to in turn *minimize* risk.



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Figure 3 – The Risk-Knowledge Infinity Cycle applied to ICH Q10

There are several important features to this framework, its symbolism and practical application to ICH Q10, including an example to a sterile filling line, which will be discussed in subsequent publications as previously detailed.

4. Conclusion

The authors envision a unified approach to managing knowledge and risk as a foundation to the PQS as depicted in Figure 4.

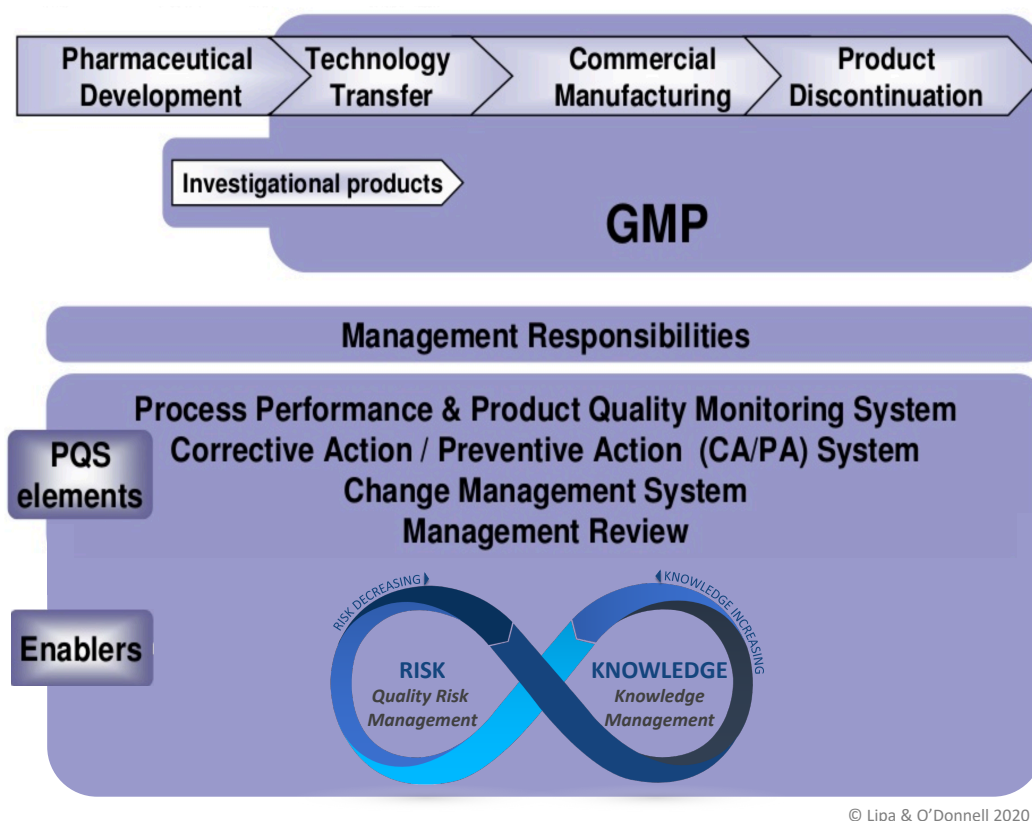


Figure 4 - A Re-framed and Unified PQS foundation

On achieving this vision, QRM and KM together can better support each of the four PQS elements and have the potential to deliver additional benefit, including achieving true risk-based control strategies, evidence-based risk reduction and more. These benefits and additional advantages will be further explored and published separately.

Disclaimer

The views expressed in this article are those of the authors and are not necessarily those of the Health Products Regulatory Agency (HPRA) or Merck & Co., Inc. (Kenilworth, NJ USA).

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