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Tacit knowledge in patent applications: observations on the value of models to early US Patent Office practice and potential implications for the 21st century

Katherine T. Durack *

Department of English, Miami University, Oxford, OH 45056, USA

Abstract

Scientist-philosopher Michael Polanyi has observed that tacit knowledge—knowledge that we know but cannot tell—is an essential part of scientific genius and the ability to innovate. He also observes that physical embodiments, particularly in combination with other means of communicating, provide one important means for transmitting tacit knowledge about an invention. Early in the history of the US Patent Office, a patent application to that Office reflected the need to capture unarticulated aspects of an invention: the application included models as well as text and diagrams. Used in disputes about the content and nature of an invention, models were a vital means for communicating about inventions to the public. This article considers the historical relationship among the various types of "texts"—drawings, texts, and models—that were once required for patent applications. It describes Patent Office arguments for and against eliminating models as evidence of invention, and concludes by raising questions about the potential value of computer models to contemporary patent activity.

Keywords: USPTO; Patent history; Patent models; Printed patent specifications; Computer models; Tacit knowledge

1. Introduction

Scientist-turned-philosopher-of-science Michael Polanyi has observed that "we know more than we can tell" [26, p. 4]. Polanyi asserted tacit knowledge—knowledge that is understood but cannot be expressed—is fundamental to scientific innovation, from the origin of an idea to its practical implementation. The researcher's capacity to know what is new Polanyi calls "the tacit power of scientific and artistic genius" [26, p. 6]. It is the very newness of the knowledge that challenges the originator's ability to capture and express it. As Polanyi puts it, "All descriptive sciences study...physiognomies that cannot be fully described in words, nor even pictures" [26, p. 5]. Furthermore, whenever we try to convey a new idea to others, we rely on the "intelligent cooperation for catching the meaning" of those we wish to reach [26, p. 5]. If we accept these observations, we can immediately apprehend the difficulties inherent in both developing and interpreting patents and appreciate the value of communicative forms and practices for conveying tacit knowledge.

2. Early US Patent Office accommodations for tacit knowledge

The difficulty inventors might have with communicating their ideas and transferring tacit knowledge was accommodated by the early US Patent Office in several ways: in the timeframe for patent protection, its use of models, and the practice of reissuing patents when claims were found deficient.

As had been the English practice since 1624, the initial timeframe for US patent protection was 14 years. This span was "based on the notion that two groups or sets of apprentices could be trained in a new technique in that period, each apprenticeship being seven years in duration" [30, p. 21] (see also [19, p. 190], about the importance of apprenticeships). By means of this timeframe, the Patent Office allowed for the transfer of tacit knowledge about an invention to a manufacturer's employees.

* Tel.: +1-513-529-2629/651-0298; fax: +1-513-529-1392.
E-mail address: durackk@muohio.edu (K.T. Durack).

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Communicating tacit knowledge within the patent system and among its users was accomplished, in part, through models for inventions. Thomas Jefferson, one member of the board first charged with examining patents, held the view that "models served better than written descriptions to convey technical information to the less skilled" [19, p. 197]. The prevailing view was that knowledge inheres within artifacts and examination of the artifact was the best way to know the nature of an invention.

Finally, until the law governing reissues was changed in 1870 to prohibit the introduction of new matter, inventors and assignees could request reissue of a patent with claims broadened to reflect features present in the model yet absent from the original specification and drawings.

To understand the significance of models as repositories for tacit knowledge to early Patent Office practice, it is helpful to place this practice in the context of general literacy in the United States. The acceptance of models as evidence of invention was at least in part a function of the generally low literacy level of citizens and a lack of widely available technical and scientific literature throughout much of the 19th century. While fee-based libraries were common from 1790 through the early part of the century, movements in support of free public libraries and public education in the US did not gain momentum until mid-century [17, pp. 89–90].

Even with these changes, by 1870 only 2% of 17-year-olds in the US graduated high school [17, p. 144], so we can assume that with regard to explicitly captured and conveyed technical and scientific knowledge, the general literacy rate was broadly limited. In such circumstances, we might entertain that "it was often easier for an inventor to build a model than to draw and describe his device" [24, p. 61]. Given the prevailing educational climate, we should not be surprised by the remarks of US Patent Office Superintendent Thomas P. Jones who, in 1828, remarked that

> Those who are unable to obtain good drawings at home, may have them executed at Washington, by persons unconnected with the office. In some cases, a rough sketch, and in all, a good model, will serve as a guide. [25]

Although the enabling characteristic of patent models was eliminated with the law of 1793 [19, p. 202], patent models were important in determining "what the applicant had *intended* to describe in the original patent document" [19, p. 205] (emphasis in original). The veracity and reliability of models as the key source for information about the essence of an invention was jealously guarded by most early- to mid-19th century patent commissioners. As Commissioner D.P. Holloway put it in the Annual Report for 1863,

> It is the duty of the office to conscientiously and rigorously scrutinize every application, and to be sure that no patent is granted for anything which is not absolutely new, and at the same time to see that the applicant shall have the benefit of whatever, whether claimed or not, *which is shown by specification*, *model*, *or drawing*, to be a new invention. [12] (emphasis added)

Throughout the 19th century, this attitude about the supremacy of models gradually declined as the practical aspects of cataloguing and displaying models for every application became unmanageable, as inventors and assignees abused the privilege of reissue, and as technologies for print reproduction improved, making it possible to publish inexpensively the descriptions and drawings of patents. Nevertheless, for much of the 19th century, models were used extensively by many for defining invention.

3. Models define invention

Models were considered "the test of the nature and extent of the invention" and the "rule by which improvements are ascertained" [2]. William Thornton, Superintendent of the Office from 1802 to 1828, argued that the specification, though "it is the legal evidence of the invention" was limited and that models were critical because "many machines are so complicated that no one but a skillful artist can comprehend their construction or mode of operation, *without inspection of a model*" [2] (emphasis added). Furthermore, models were essential for resolving competing claims: "in all cases of dispute, respecting the extent of improvements in the principles of original machines of any complexity, it is impossible for a court or jury to judge correctly, without a model exhibiting the improvements" [25]. Subsequent reports also indicate the models provided an important means by which applicants could examine prior art.

When fire destroyed the Patent Office and its records in 1836, the US Congress responded by requiring the Commissioner to collect and arrange for public display "models and specimens of compositions and of fabrics and other manufactures and works of art, patented or unpatented, which have been, or shall hereafter be deposited in said office" [1]. An aggressive effort to replace the models lost in the fire was begun, and by 1848, over $41,000 had been expended toward this aim [6]. Though Dood argues that the Office's ultimate inability to restore the lost models reflects a decline in their perceived value, "models of new inventions kept arriving at the Patent Office, and by 1844 the model collection was as large as it had been before the fire" [19, p. 214].

The models were also important symbolically. As the collection was being created, commissioners felt the new