Incorporating Global Medical Knowledge to Solve Healthcare Problems: A Framework for a Crowdsourcing System

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ABSTRACT

Global medical knowledge incorporates knowledge from diverse traditions which follow different ‘grammar’, making encapsulation of medical knowledge a challenging task. Current advances in technology enable the aggregation of medical knowledge from varied traditions to confront difficult health issues for which cure is yet to be developed. In addition to accumulating knowledge from wide-ranging sources, an ideal crowdsourcing system can benefit from the use of appropriate software algorithms to select the best solution. This research suggests a step approach scheme to develop a crowdsourcing system for medical diagnosis by applying an existing classification of crowdsourcing. The proposed crowdsourcing system will involve the crowd and medical experts from across the world, who together with the help of software algorithms, could provide useful solutions for hitherto difficult to solve health problems.

KEYWORDS
Crowd, Crowdsourcing, Global, Healthcare, Medical Knowledge

1. INTRODUCTION

In today’s technology-driven world, an opportunity exists to share information or knowledge through internet-enabled systems. Global organizations have used crowdsourcing technology to solve a wide array of problems related to diverse topics, such as, new product ideas and the improvement of existing products or services (Afuah & Tucci 2012; Surowiecki & Silverman, 2007; Zimmerman, 2016). In general, crowdsourcing has been employed to accomplish four main categories of tasks: problem solving, data processing, monitoring, and surveying.

In the healthcare domain, crowdsourcing has been used to answer important health-related questions (Ghosh & Sen, 2015). Generating ideas to solve medical problems is a more recent phenomenon in crowdsourcing in the healthcare sector (McCartney, 2013). This is illustrated with the advent of platforms such as CrowdMed, a crowdsourcing system that outsources rare medical cases to the crowd, which trained medical experts have not been able to unravel.

Medical knowledge signifies information relevant to the field of medicine. ‘Global’ medical knowledge incorporates knowledge from different medical traditions which follow a variety of ‘grammatical rules’ based on how the knowledge is applied. This makes the encapsulation of such a diverse body of knowledge difficult. Considering these challenges, in this paper we propose a framework to develop a medical crowdsourcing system that will allow obtaining relevant global medical knowledge from diverse traditions. The suggested crowdsourcing system will include the
crowd and medical experts from all across the world representing different medical traditions. These entities together with the help of software algorithms will generate suitable solutions for health problems for which cure is not yet known. We believe that the solutions will originate from the aggregate knowledge coming from diverse medical philosophies as well as thoughts from a broad spectrum of medical practice and traditions. This knowledge will most likely cure the rare medical problems.

The paper is structured as follows. We begin by discussing crowdsourcing typology (Budescu & Chen, 2015). Next, we consider issues related to the creation of knowledge, types of knowledge, and its subsequent transfer (Hayek, 1945; Jensen & Meckling, 1996). We then explore the challenges associated with capturing global medical knowledge. Subsequently, we use classification of crowdsourcing based on the method used to analyze the crowd contributions (Prpić, Shukla, Kietzmann, & McCarthy, 2015) as a ‘springboard’ to recommend a step approach to develop a crowdsourcing system that involves the crowd, medical experts, and software algorithms for medical diagnosis of health issues for which a cure has not been developed. Finally, we present closing arguments on the promise of crowdsourcing systems that rely on bringing together knowledge from diverse sources.

2. CROWDSOURCING TYPOLOGY

There are many types of crowdsourcing systems with different objectives. Crowd polling systems are often used as a method for getting information from crowds about their opinions, while crowd-solving systems involve the incorporation of numerous individuals in teams undertaking creative work (Peisl, Selen, Raeside, & Alber, 2014). Crowd processing systems rely on large number of contributions. Contributors collectively process tasks in sizable numbers to minimize the use of traditional organizational resources (Budescu & Chen, 2015). Crowdfunding is a special type of crowdsourced product that is used as a method for generating funds from many individuals to sponsor businesses, creative projects, charities, and more.

Crowd-solving involves gathering ideas from individuals and the aggregation of ‘intangible’ goods in the form of the crowds’ knowledge or information (Kamajian, 2015; Prpić, Taehagh, & Melton, 2015). On the other hand, crowdsourcing strategies like crowdfunding and crowdpolling involve asking individuals to make ‘tangible’ contributions in the form of currency (crowdfunding) or votes (crowdpolling).

Given the above distinction, crowdsourcing for medical diagnosis falls in the first category, which is crowd-solving; crowds contribute their ideas to solve medical problems by offering diverse solutions. Medical knowledge is often abstract and complex, a discussion that follows later in the paper. It is a greater challenge to capture this type of knowledge, than, for example, collecting ideas on improving the design for a product or gathering inputs on how to market a new product.

Successfully engaging a crowd and effectively acquiring the desired contributions from it are necessary but not sufficient by themselves to generate relevant and important knowledge from the crowd. Procedural rules and associated algorithms used by the crowdsourcing system are critical in achieving the desired objective of effectively organizing, filtering, and integrating the incoming crowd contributions. The processes employed by the crowdsourcing system must be able to integrate a diversity of opinions from the crowd. Furthermore, successful implementations of crowdsourcing systems should focus on fostering varied opinions. This may be achieved by selecting judges or experts with different backgrounds, eliciting their inputs independently, and injecting diverse thoughts to affect their original ideas (Herzog & Hertwig, 2009).

3. THE DISCOURSE ON KNOWLEDGE

Knowledge accumulation is a basic function of technology-enabled crowdsourcing systems (Ghosh & Sen, 2016). Once it is accrued, the system needs to filter the knowledge that is useful in solving
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