Stratifying Altmetrics Indicators Based On Impact Generation Model

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Introduction

Altmetrics has been a shelter for all possible alternative indicators corresponding to traditional citation-based indicators, with extra focus on online indicators. Altmetrics has been discussed in variety of contexts, such as open science (Mounce, 2013), institutional depositories (Adie, Francois, & Nixon, 2014), publishing industry (Piwowar, 2013) and scholarly communication reform (Priem, 2013) etc. Despite the wide recognition and adoption of altmetrics, it has been criticized that stakeholders get confused by so many altmetrics indicators and the exact meaning of each indicator is unclear.

We need a methodology with which the existing altmetrics indicators and future potential indicators can be incorporated and interpreted in a manifest and logical way. To reach this goal, this study will:

(1) firstly, tap into the meaning of impact by demonstrating the multi-faceted nature of it.

(2) secondly, based on multiple empirical researches, introduce an impact generation model that describe how impact becomes perceivable and measurable.

(3) thirdly, making use of the impact generation model, explore the different role that each altmetrics indicator plays in the impact generation process. Combined with the level of engagement theory, altmetrics indicators are stratified and logically ordered.

(4) fourthly, discuss the merits of the stratification based on impact generation model.

Exploring the meaning of impact

To make the idea of scholars' impact more intuitive, Figure 1 was created to demonstrate the composition.

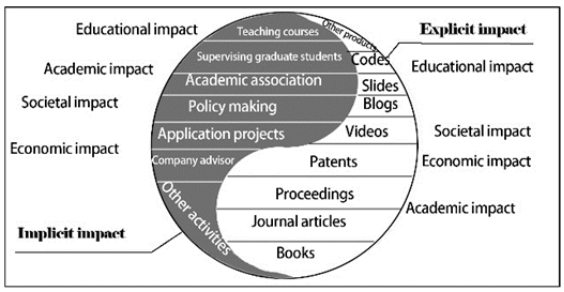

Figure 1. The composition of scholars' impact.

From Figure 1, we see scholars' impact is composed of two parts, the explicit impact derived from scientific products which is usually made public and thus well known by the academia, and the implicit impact brought by non-scientific activities that are often neglected or not well measured by the administrators. In order to achieve explicit impact, scholars keep active in manufacturing various types of scientific products. The major type is publications such as currently prevailing journal articles, books and proceedings. Meanwhile, in the web-native age, novel types thrive. Popular ones include talk videos, slides, codes and blogs. Different types of products are likely to yield different forms of impact. For example, journal articles and proceedings bring more academic impact although they can be used for developing technologies as well. Patents and codes usually benefit to societal or economic impact, and slides and videos will contribute to educational impact.

Impact Generation Model

Inspired by Priem's (Priem & Costello, 2010) theory of capturing the trace of invisible college using altmetrics indicators, and empirical studies (Wang et al., 2014) on exploring the quantitative relationship between different altmetrics data, an impact generation model was proposed to illustrate the process, as shown in Fig. 2. To keep the model as concise as possible, only three principal modules are preserved.

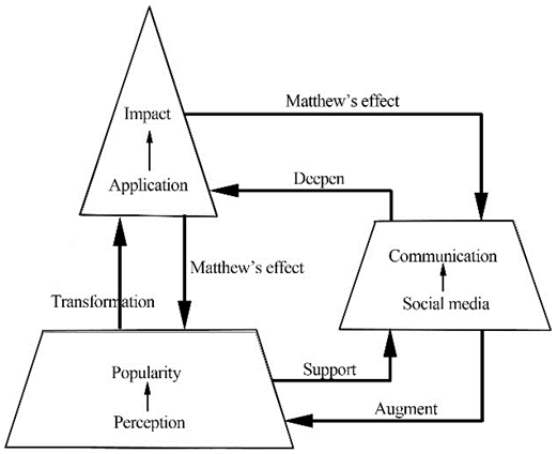

Figure 2. Impact generation model.

The basic philosophy in the model is transformation, which means that the higher level is transformed from the lower level, and the explicit level is transformed from the underlying level. The model has four basic features.

(1) Parallel relationship between the underlying world and the explicit world. Behind popularity is perception. The more scientific products are perceived by people, the greater popularity they gain. Behind impact is application. Whatever the application form is, the more scientific products are used and adopted by the others, the higher impact they obtain. Similarly, behind communication is social media. The more efficient and intelligent the social media is, the more active communication will become.

(2) Transformation from the lower level to the higher level. Only when scientific products get used, or adopted and become sensible, can it be claimed that the scientific products have generated real impact.

(3) Matthew's effect from the higher level to lower level. Once scientific products are used, especially when used successfully, they are likely to be propagated more widely.

(4) Social media (Communication) plays an important role in the model. Social media connects between perception level and application level.

Stratifying altmetrics indicators

An economic analysis of level of engagement phenomenon

It is argued that every type of altmetrics indicator is conveying certain degree of recognition, which is reflected in the level of engagement. It is observed that different altmetric indicators have different difficulty in accumulating data, because of the different cost for users to generate the data. Users' generation cost mainly includes three parts: (1) the time cost; (2) and the reputation cost; (3) and the energy cost. For example, it is much easy for a user to click a paper, but not so easy to read the full-text; It is a little hard for a user to download a paper and save it into his own library, because it takes his future time to deal with it; And it is harder for him to share it with his colleagues, because he is only willing to share those that he think his colleagues will also highly appreciate, in this case, the paper represents his judgment and influence his reputation. The hardest thing to do, perhaps, is citing one's work, because citation is a formal acknowledgement to the work and thus cautiously selected, and usually takes several months to obtain.

Stratification of altmetric indicators

The stratification is conducted in two main steps. The first step is to judge which level the indicator belongs to. The second step is to compare the cost of indicators in each level. The result is demonstrated in Figure 3, where each indicator finds its place in the triangle pyramid.

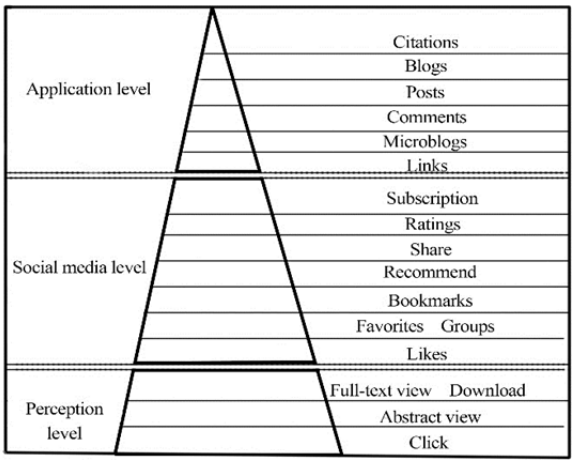

Figure 3. Stratification of altmetrics indicators in the pyramid form.

Merits of the stratification

The stratification has several important advantages compared with the previous classification systems. (1)It clarified the logical relationship between groups of altmetrics indicators. (2) It introduced the transformation relationship between specific indicators. (3) It integrates the previous classifications and helps unify the aggregators' standards in collecting data. (4) It is beneficial in understanding the meaning of impact and the contribution of altmetrics in shaping the current landscape. (5) It can be used to illustrate the relationship between altmetrics and traditional bibliometrics.

Acknowledgments

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