Level Of Knowledge Use Survey (LOKUS): A validated instrument for tracking knowledge uptake and use.

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Abstract. Researchers working in fields intending to generate beneficial socio-economic impacts are increasingly challenged to demonstrate evidence that the findings from their studies have value to audiences beyond the peer academic community. These diverse and diffuse target audiences may include clinicians, consumers, manufacturers and information brokers. This paper summarizes a project that designed, constructed and validated a web-based instrument for collecting and analyzing self-reported data on knowledge use. The Level Of Knowledge Use Survey instrument is valid and reliable for measuring uptake of new knowledge and for tracking changes in level of knowledge use over time.

Keywords. Measurement, knowledge translation, level of use, knowledge uptake, non-awareness, awareness, interest, use, validated instrument, web-based, survey.

Introduction

Scholars conducting scientific research and engineering development projects, along with the government agencies sponsoring these projects, are under increasing demands from elected officials and from the public to demonstrate evidence that the their project outputs have value to society. The demand is for evidence that research discoveries are being put into professional practice, and that development prototypes are being transferred into new or improved products. This demand for greater accountability results from economic declines that force all programs that spend public funding to show how the investment is benefitting society.

This demand for accountability does not and should not extend to basic or fundamental scientific research. However, it is very appropriate to set such expectations for

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government-sponsored programs that exist for the explicit purpose of generating beneficial socio-economic impacts, through applied research and development. Assistive & Rehabilitation Technology (AT) devices and services is a case in point.

Demonstrating evidence of academic uptake by peer scholars through paper citations and journal impact factors, is no longer sufficient for the field of AT which is expected to directly improve the quality of life for persons with disabilities. Instead, elected officials and the intended beneficiaries are demanding evidence that the knowledge generated from government-sponsored R&D activity is being effectively communicated out to non-traditional stakeholder groups. These groups include clinicians/practitioners, consumers and family members, device manufacturers, and information brokers such as employers, educators and attorneys. The brokers play a key role in delivering beneficial impacts by facilitating the implementation of new knowledge in various settings. Therefore demonstrating evidence of knowledge uptake, adaptation, adoption and use by these stakeholders would satisfy the increasing demand for accountability, and also yield specific examples of how the knowledge is resulting in beneficial socio-economic impacts. Such examples could justify continued and perhaps even increased funding for effective projects and programs.

Knowledge Translation (KT) offers strategies to help scholars communicate the value of new knowledge from R&D projects to members of such non-traditional stakeholder groups. The adoption, uptake and use of new knowledge is recognized as an intermediate outcome and indicator of progress towards achieving the intended beneficial impacts in the long-term [1]. The KT strategies applied to improve communication with such stakeholders, includes targeting recipients, tailoring material to their values and contexts, and employing multi-media channels.

However, having the tools is not enough. Investigators are challenged to reach diverse non-traditional audiences comprised of individuals diffused throughout society, especially when they are used to communicating with other scholars efficiently through the publication and citation system. How does one even identify individuals in these stakeholder groups who may be interested in the new knowledge from R&D projects?

The authors recently explored one approach that requires investigator's to engage professional membership organizations in relevant fields, because their members represented the targeted stakeholder audiences. The study results showed that such national organizations could serve as efficient channels of communication, that they were interested in forming such collaborations, and were eager to share new knowledge findings and prototypes from R&D projects with their members [2]. There are probably other avenues to reach non-traditional stakeholders, but the challenge of demonstrating evidence of knowledge use remains.

Let's assume that new knowledge output from R&D projects has important practical value to multiple non-traditional stakeholders. Let's also assume that scholars are successful at communicating the new knowledge to these diverse and diffuse stakeholders, whether through professional organizations or some other approach. The key remaining challenge is measuring and tracking the extent to which the stakeholders engage with the new knowledge, at what level and to achieve what beneficial outcomes and impacts? The challenge is magnified by the requirement to administer any measurement and tracking instrument remotely and over time. The project team moved forward with a process to create the Level Of Knowledge Use Survey (LOKUS) instrument, which is designed to differentiate between levels of use for survey respondents, and through repeated measures determine changes in their level of use.

1. Methodology

An exhaustive description of the methodology for instrument conceptualization, design, testing and validation can be found in an open access paper recently published in Sage Open Medicine [3]. This short conference paper summarizes the details as follows.

The LOKUS instrument was generated in the context of assessing the effectiveness of knowledge communication strategies in assistive/rehabilitation technology. It was validated by survey participant samples representing the five stakeholder types mentioned earlier. LOKUS is broadly structured on the Stages of Innovation adoption [4], while its item generation protocol was guided by the Levels of Use Framework [5].

A scoping review did not reveal any existing survey instruments for measuring knowledge uptake and use among non-traditional stakeholders, diffused throughout society, or functional as an internet-based tool. As a result, the project team devoted the time and resources necessary to design, construct, test and administer such an instrument. Existing literature on knowledge use revealed four distinct levels of knowledge engagement: 1) Non-awareness, 2) Awareness, 3) Interest, and 4) Use. The fourth category subdivided into two forms of use: A) Use as intended by the knowledge creator, or B) Use as modified by the knowledge recipient.

Survey item selection was based on content validity indices computed from expert ratings, with five representative stakeholders established usability for the web-based version of the LOKUS instrument. The actual LOKUS instrument is available for inspection as both a PDF document [6] and as the on-line web version [7].

The final web-based LOKUS instrument includes 47 items (content validity index for individual items >.78; content validity index for a scale or set of items >.90), in self-reporting format. The psychometrics properties were then established for LOKUS.

2. Results

Analyses of data from small ($n = 69$) and large ($n = 215$) samples using the LOKUS instrument suggested a conceptual model of four levels of knowledge use—Non-awareness, Awareness, Interest, and Use. The levels covered eight dimensions and six user action categories. The sequential nature of levels was inconclusive due to low cell frequencies. The LOKUS instrument showed adequate content validity (≈ 0.88; $n = 3$) and excellent test–retest reliability (1.0; $n = 69$). It also demonstrated good construct validity ($n = 215$) for differentiating among new knowledge outputs ($p < 0.001$) and among stakeholder types ($0.001 < p \leq 0.013$). It showed strong responsiveness to change between baseline and follow-up testing ($0.001 < p \leq 0.002$; $n = 215$).

The full paper referenced above [3] contains dozens of additional pages describing the between-group and within-group differences in both narrative and tabular formats. As

one might expect, self-reported responses to survey items over time adds variance to the data, yet the psychometric results demonstrate reliability and validity.

3. Conclusion

The LOKUS instrument demonstrated strength in its content validity, test–retest reliability, and construct validity for distinguishing levels of knowledge use, both across published findings and across stakeholder types. LOKUS also demonstrated strong responsiveness to changes in level of knowledge use over the four-month timeframe employed for test-re-test reliability.

Scholars can apply LOKUS with confidence to document the level of new knowledge use within and across a range of stakeholder types. LOKUS differentiates four levels of knowledge use: (1) Non-awareness, (2) Awareness, (3) Interest, and (4) Use, which collectively encompass eight dimensions and thirty-seven activities of knowledge use.

Any investigator in the field of AT can apply LOKUS through a web-based survey to track the level at which the results of their R&D projects have been found, read, understood and applied by clinicians, manufacturers, consumers or brokers. Since these non-traditional stakeholders do not typically write papers and cite authors of prior work, LOKUS is the only way for investigators to gather objective and quantifiable evidence that their activities are resulting in knowledge uptake and use, and to provide specific case examples of the outcomes and impacts in society.

The LOKUS instrument can generate evidence of knowledge use at a level of detail that was previously unavailable. It is important to note that the questions and details of the LOKUS instrument referenced here [6, 7] were tailored to the requirements of our own study's interventions. The LOKUS content can be changed to represent queries into any study finding, topic area or discipline inside or outside the field of AT.

Future work is required in order to substantiate the sequential nature of the levels of knowledge use, and to examine the interrelationships among the many dimensions.

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