* Title: Accelerating Meta-Analyses with HubMeta: An Open Science Platform

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* Intended participants and admission criteria for the participants: Those interested in conducting a meta-analysis
* Time requirement of the workshop: Two Hours

Workshop Summary

One of science’s most fundamental tools is meta-analysis, allowing us to better determine the empirical truth. The process requires combing through the literature, gathering the empirical results pertaining to a finding, transforming these to a common metric, and analyzing the data. With explosive growth in many fields, many doubling in size every nine years, traditional methods have been stressed with many researchers subsequently choosing to focus on smaller and more manageable topics. HubMeta is a new platform that brings the field more fully into the modern age, using automated and cloud-based processes, specifically: built-in analysis, easy export functions, automated data extraction, taxonomic features and process management for large teams. Altogether, it increases speed and scope of meta-analysis by an order of magnitude, vastly accelerating science as a whole. Participants of this workshop are provided free accounts and training to accelerate as well as expand their own meta-analytic endeavors, with aims to enable collaborative projects previously prohibitive in size. Examples will include some of the largest meta-analyses ever attempted in the management sciences and the platforms that enabled them.

Why the Workshop Should Be of Interest

One of the greatest challenges and opportunities in the information age is making sense and making use of a vast sea of information. To address this need, we increasingly rely on meta-analyses. The process requires combing through the literature, gathering the empirical results pertaining to a finding, transforming these to a common metric, analyzing the data and presenting the results clearly. Executing these steps typically relies on an antiquated infrastructure that hearkens back to the pre-internet days (Bosco, Uggerslev, & Steel, 2017). First, producing meta-analyses is extremely time-consuming due to inadequate search systems for locating relevant studies (Lefebvre et al., 2013) and to labour intensive manual data-extraction processes. Second, with the volume of reported scientific findings presently doubling every nine years (Bornmann & Mutz, 2015), meta-analyses are increasingly difficult to do, become outdated quickly and tend to be non-cumulative. With multiple teams duplicating each other’s efforts, both in parallel as well as sequentially, the entire process becomes highly redundant and wasteful. As Schmidt and Hunter (2015) write, “We need a new type of journal…that systematically archives all studies that will be needed for later meta-analyses.... failure to have such a journal system in place is retarding our efforts to reach our full potential in creating cumulative knowledge” (p. 30). Third, meta-analyses are often impossible to reproduce fully, with conflicting results on the same topic given by different research teams (Lakens, Hilgard, & Staaks, 2015). Limited information is typically given regarding the studies and individual effect sizes that are included (or excluded), data manipulations such as sign reversals and transformations, filtering decisions, and analytic options. In line with the Vienna Principles from The Evidence-Based Research Network (i.e., <http://ebrnetwork.org/the-vienna-principles/>), we have developed a platform that helps rectify many of these shortcoming.

One Page Description of the Workshops' Format

Essentially, HubMeta allows geographically dispersed teams to work together and ingest research results into a database at up to ten times previous speeds, analyze them immediately, and export the results into a publication ready format. The goals of the HubMeta project are to enable larger and more comprehensive meta-analyses, one’s that were not previously possible with conventional means. In particular, we seek to assist large meta-analytically enabled structural equation modeling (MA-SEM). Consequently, this workshop is intended for any audience who is interested in conducting or being involved in a meta-analysis; no specific content knowledge is required. Time required: Two hours.

Participants in this workshop will have the opportunity to explore HubMeta’s data entry and analytic functions as a means to address their own research projects. At the start of the session, users will be given information needed to register for a free (by default) HubMeta account. During the workshop, we will focus on the following four learning objectives:

1. Demonstrate the need for the new HubMeta Infrastructure
2. Explain How to Code Meta-Analyses in HubMeta
3. Explain How to Analyze Meta-Analyses in HubMeta
   1. How to do basic meta-analyses
   2. How to create meta-analytic matrices
   3. How to do moderator analyses
   4. How to use filters, export data, etc.
4. Demonstrate How to Conduct a Meta-Analysis in Minutes Using HubMeta

Overview of the Workshop

# Learning Objective #1: Demonstrate the need for the new HubMeta Infrastructure

First, we will explain the background of the project and the specific issues the project has undertaken to address in terms of improving the process for quantitative synthesis in our discipline. We will describe the ongoing evolution of meta-analysis, and the growth of fields, vastly increasing the research base. In addition, the need to address theory and the development of MA-SEM increasing requires the construction of meta-analytic matrices, increasing the potential size of meta-analyses by an order of magnitude or more. This coding demands is such that traditional methods are inadequate, with many choosing to focus on smaller and more manageable topics in response. Consequently, we review two recent correlation and mean based meta-analyses that are among the largest our field has produced – enabled by new cloud-based meta-analytic platforms – what type of new answers they can provide and why we need to reinvent how we do meta-analytic research:

* Steel, P., Schmidt, J., Bosco, F., & Uggerslev, K. (2018). The effects of personality on job satisfaction and life satisfaction: A meta-analytic investigation accounting for bandwidth-fidelity and commensurability. *Human Relations*.
* Steel, P., Taras, V., Uggerslev, K., & Bosco, F. (2017). The happy culture: A meta-analytic review and empirical investigation of culture’s relationship with subjective wellbeing. *Personality and Social Psychology Review.* <https://doi.org/10.1177/1088868317721372>

We also stress that the new meta-analytic tools now enable us to address meta-analyses of previous obtainable scope and depth, allowing attendees to expand their aims.

# Learning Objective #2: Explain How to Code Meta-Analyses in HubMeta

Second, we will explain the HubMeta structure and its capabilities. To clarify, HubMeta is able to accelerate correlation or mean based meta-analyses, but *not* instant systematic reviews nor experimentally based meta-analyses. We aim to clearly communicate the differences among these goals during the session. Properly conducted systematic reviews require incorporating non-meta-analytic material, including theoretical reviews and qualitative works. Rather, HubMeta excels in correlation and mean based. After walking attendees through to obtain a free (by default) access to HubMeta (<http://www.hubmeta.com>), we cover the following features:

1. Able to create separate projects, share and integrate them
2. Ability to import an article list from EndNote or Mendeley, with all fields appropriately delineated (e.g., year, journal, author)
3. Taxonomic creation, where specific measures can be nested under broader constructs
4. Variable management systems, to quickly identify using standardized nomenclature what was measured in a study
5. Moderator variable management
6. Ability to import correlation tables directly from PDF using built in optical character recognition software
7. Direct data entry and conversions
8. PRISMA diagram development

# Learning Objective #3: Explain How to Analyze Meta-Analyses in HubMeta

Third, we will show audience members how to use HubMeta to directly analyze their database seamless from the platform. Using the Hunter-Schmidt (2015) psychometric meta-analysis as a starting point, we review the analysis of several existing databases. Typical analyses needed to report meta-analyses in publications are shown to be automatically provided and in an easily convertible publication format, minimizing transcription errors. In addition, the platform is shown to automatically provide the entire meta-analytic matrix, as specified by the user. For MA-SEM, this can be exported into a preformatted form for immediate analysis by R or Stata, again minimizing transcription errors. If the user wants to conduct their meta-analysis using other software, their entire dataset can be download in CSV format for immediate analysis. Basic moderator analysis and filtering functions (e.g., by year of publication) is also applied.

# Learning Objective #4: Demonstrate How to Conduct a Meta-Analysis in Minutes Using HubMeta

Fourth, we will provide a live meta-analysis using HubMeta software. Using attendees themselves as coders, we will replicate the coding work needed for a traditional publishable meta-analysis. Each attendee will receive one or more articles to code. Estimated time to code an article is under 15 minutes. We will compile the results, analyze them and compare them to a published work, demonstrating the accelerated speed meta-analyses can be conducted.

# Summary

This session describes how the HubMeta project can accelerate meta-analyses. With continued development between now and the workshop, we plan also to demonstrate additional features, especially those that further automate and accelerate the coding process. The session facilitators will discuss the purpose and goals behind the HubMeta project, demonstrate the various HubMeta tools described above in the learning objectives. Participants will be able to interact directly with the software and explore for themselves how it might be useful to them in their future research endeavors.