



# Institutional Research Evaluation Model (IREM): A framework for measuring organizational research trends and impact and its application in medical academia in Saudi Arabia

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## KEYWORDS

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**Abstract** Increased financial and human resource constraints for research and development (R&D) imply rigorous research evaluation to guide the research policy for wise allocation of resources. In this study, we developed a conceptual framework called the “Institutional Research Evaluation Model” (IREM) to evaluate the quality of research and its determinants. The IREM was then applied to a medical institution to study its applicability in Saudi Arabia. The IREM consists of five levels: duration decision; choice of research quality indicators [impact factor (IF), article influence scores (AIS), citations per paper (CPP), and publication in indexed journal]; trend indicators (numbers of publications, study design, subject); data extraction; and statistical techniques to determine the factors affecting impact of research. Application of the IREM to the College of Medicine, King Saud University (CMKSU) for research evaluation from 2003 to 2013 revealed that during this duration, 1722 studies were published, the highest in 2013 ( $n = 314$ ) and 85.5% ( $n = 1472$ ) in indexed journals ( $p < 0.001$ ). The mean IF was 2.6, mean AIS 1.16, and mean CPP 10.06. IF was positively associated with duration, indexation, CPP,

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and subject being human genetics at multivariable linear regression. The IREM is an applicable basic tool for institutional research evaluation which can guide the research policy.

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## 1. Introduction

Research and development (R&D) in the field of medicine supports medical advances to improve the quality of life, as well as life expectancy [1]. This in turn increases the economic development of the nation [1]. Academic institutions are the hub of R&D. In USA, more than 60% of basic research takes place in the universities [2]. The most effective form of research organization is academia, where collaborations and outsourcing can take place for widespread research [2].

R&D requires a lot of financial and human resources. In 2013, about 1.5 trillion USD was spent for R&D globally [2]. The expenditure of R&D as percentage of gross domestic product (GDP) has increased from 2.5% in 2005 to 2.8% in 2012 for USA, which contributed 29% of share in global R&D spending in 2012 [2]. On the contrary, countries like Kingdom of Saudi Arabia spend only 0.058% of their GDP on R&D [3]. According to the Scopus database, approximately 22,338 research documents were produced in the country from 1996 to 2013 with an average of 8.42 citations per document [4]. This makes the ranking of the Kingdom fourth, among the Middle Eastern countries in terms of production of research in the field of medicine [4]. The R&D spending on biomedical research is decreasing in western countries like USA, Canada, and Europe and increasing in Asian countries like China, India, Japan, and Korea [5]. Universities receive 10 times more funding for research as compared to other organizations in USA [2].

The limited resources for R&D require rigorous research evaluation to pave the way forward for research policy so that R&D funds can be utilized effectively for high impact research outcomes [6]. Although research evaluation methods have been devised to compare research outputs at national and international levels [3,7,8], intrainstitutional systematic research quality and trend evaluation models are lacking. In this study, we aimed to develop a conceptual framework to evaluate the trends and impact of organizational research and called it the Institutional Research Evaluation Model (IREM). As mentioned above, academia/universities play a pivotal role in R&D,

and we applied this model for research evaluation at the College of Medicine, King Saud University (CMKSU), Saudi Arabia as a case study. Research policy was suggested based on its findings.

## 2. Materials and methods

### 2.1. Development of the IREM

Before development of the conceptual framework for the IREM, the goal and objectives were explicitly pronounced for the IREM. The goal of the IREM was to provide institutional research evaluation to guide the research policy for R&D. The objectives were to give a concise and clear concept for the quality assessment of R&D of an institution in quantitative terms. The IREM consists of five levels or steps (Fig. 1):

- **Level 1:** make decision about the duration of research evaluation. The researcher can define the time period, for example, 1 year, 2 years, 5 years, or 10 years. If the evaluation is to be done for the first time, it should be done for a longer duration. Evaluation can be done periodically thereafter.
- **Level 2:** choose the research quality indicators to be used in research evaluation. There is a range of indicators for assessing the quality of research [9], produced by the institution. Some of these indicators are:
  - Impact factor: Garfield and Sher developed the indicator "impact factor" (IF) in the early 1960s to select the journals for the Science Citation Index (SCI) [10]. IF is defined as the number of citations of publications in the journal in 2 years to the number of published articles in the journal in the same 2 years [10]. IFs are available from the Journal Citation Report (JCR) on the Web of Knowledge and SCI [9].
  - Article influence score: article influence score (AIS) measures the average influence of each of the journal's article over the first 5 years after its publication [11]. It is also available from the JCR.
  - Cites per paper: citations per paper (CPP) is defined as the number of times or the frequency with which the published article is cited [8]. CPP measures the performance or the impact of individual articles. CPP can be retrieved from Google Scholar. The average CPP can be calculated as the total number of citations for all the papers in a

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