

The future imagined: Research in the age of the Fourth Industrial Revolution



University of Johannesburg: Anticipating the Fourth Industrial Revolution

Anticipating the challenges, disruptions, and opportunities of the Fourth Industrial Revolution, University of Johannesburg (UJ) has been expanding its mission from a comprehensive university to an innovative research enterprise. UJ leaders want to attract collaborators, graduate students, and colleagues who will complement their skills and work together to enhance the university's reputation.

To **explore** the most interesting questions, **solve** the most challenging problems and **share** knowledge most efficiently, UJ is equipping its research faculty and students with tools to address **three critical paradigms**.



University of Johannesburg

- **Founded** January 1, 2005
- **Faculties/Schools:** Education, Law, Science, Engineering, Management, Humanities, Health Sciences, Education
- **Merged** Rand Afrikaans University, Technikon Witwatersrand and the East Rand and Soweto campuses of Vista University
- **Mascot:** Hoopoe
- **Notable Alumni:** Chris Froome, Adam Habib and Tshilidzi Marwala
- **Number of students** (50,000, with 3,000 international students from over 80 countries)
- **THE Impact Rankings:** 43rd in Gender Equality

The “Fourth Industrial Revolution” comes from a book by Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum. This revolution is characterized by disruptive technology that influences all disciplines, economies and industries, even challenging ideas about what it means to be human. The components of The 4IR include the Internet of Things (IoT, i.e., incorporating the Internet into everyday objects and multiple devices); blockchain; 3D printing and artificial intelligence (AI). Thus the 4IR creates new business models, new products and new experiences for customers.

Experts question the benefits of the 4IR. On the one hand, we can connect billions more people to digital networks, enjoy massive productivity increases and rebuild the natural environment. On the other hand, organizations and governments face challenges in adapting to the new environment and new technologies, while shifting power creates increased security concerns, inequality gaps grow larger and societies tend to be more fragmented. The key to success in the Fourth Industrial Revolution will be collaboration across geographies, sectors and disciplines.

Source:

<https://www.pwc.com/us/4IR>

<https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>



Paradigm 1: Competition and impact

“As soon as you decide you want to take a leadership role in the research game, you need to know what everyone else is doing.”

—Professor Maria Frahm-Arp,
Library Director

Reputation and impact have transitioned from fuzzy concepts — “what everyone knows” — to a complex range of metrics that balance qualitative insights with quantitative information. To obtain and dig into those numbers and insights, UJ uses a sophisticated suite of programs from Elsevier. These solutions allow everyone — from researchers at the bench to chancellors in the central office — immediate access to data and insights. Data is one element of the puzzle that Elsevier solutions provide, but with context UJ gains insights.

Where do we stand in the world of research?

To establish everyone’s place on the playing field, SciVal operates like a virtual, dynamic, current scorecard. SciVal provides UJ with a lens into how the institution benchmarks against other universities, or how a particular department compares with others at different universities. With SciVal, UJ gets answers to questions like, “What are our unique areas of excellence? How can we highlight the impact of our research when we’re in the market for attracting new faculty and getting our grants funded?”

Library Director, Professor Maria Frahm-Arp, shares, “That’s why SciVal is unbelievably useful for us, because it helps us to benchmark...it also helps us to see where on rankings we are, what funding is available, and what are our competitors doing.” She continues, “Our VC is constantly telling us that we need to be the first

university, we need to be the best university in South Africa. So what is UCT [University of Cape Town] doing?” UJ leverages SciVal to make important comparisons, analyze and understand its research presence and uncover insights needed to help shape strategic decisions.

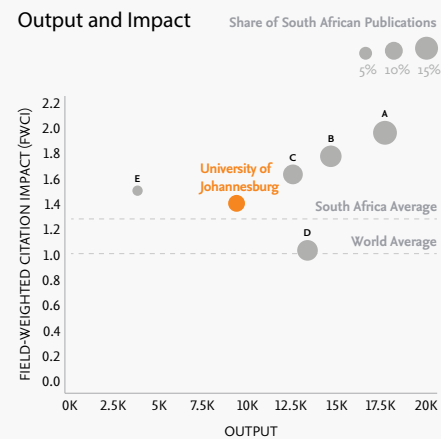
Teaming up for research: Who should we bring onboard?

SciVal also helps UJ make effective internal decisions that ultimately affect its research profile. Research administrators need to know “When we set up a center of excellence, who should we hire to gain the most impact?” and “How can we identify the true research impact of faculty candidates for appointments and promotions?” SciVal helps UJ find answers by benchmarking current staff and applying scenario modeling when deciding who to recruit and who to retain.

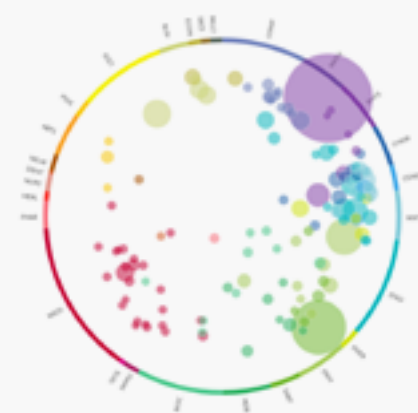
To dig deeper into the qualifications of individual faculty candidates, admins also turn to Scopus. Andre Strydom, Vice Dean of Research and Postgraduate Studies at the Faculty of Science and an active physics researcher, identifies Scopus as “the number one database for the University of Johannesburg in promotion criteria as well as appointment criteria.”

He further shares that “University of Johannesburg nowadays demand that there be a Scopus bibliometric profile attached to application documents. We insist that either a Scopus bibliometric citation analysis be attached to appointments as well, or an alternative to those.”

Scopus lets admins like Professor Strydom easily pull up a researcher’s profile, verify data on a CV and dive even deeper into the impact of their listed work. From there, research managers can use SciVal to go one step further and ‘pre-imagine’ what adding a new researcher to a team could mean for UJ.



This graph shows where University of Johannesburg sits in terms of output and citation impact compared to other South African universities.



Size of circle indicates the relative scholarly output contribution from the University of Johannesburg and the color indicates the subject area contribution to each Topic.

Topics are a collection of documents with a common, focused, intellectual interest and Prominence is an indicator of the momentum of the Topic based on Citation Count, Scopus Views Count and average CiteScore.

The Topic Prominence in Science wheel shows the University of Johannesburg’s contribution to the Top 10% Topic Clusters worldwide by Prominence.

For more information, see <https://www.elsevier.com/solutions/scival/releases/topic-prominence-in-science>.

Topic Clusters are formed by aggregating Topics with similar research interest together to form a broader, higher-level area of research.



Paradigm 2: Collaborative research across universities, countries and disciplines

“We do research to improve the lives of everybody in our country and in our society globally. So, it’s very important to bring in people from government and people from industry.”

—Professor Maria Frahm-Arp,
Library Director

In today’s competitive environment, UJ feels increased pressure to demonstrate the value of their research. By collaborating with colleagues in other universities as well as industry partners, UJ faculty become more visible as individuals and as members of a known department. Studies consistently demonstrate that collaborations, with more partners and more diverse partners, lead to higher citation rates¹.

Seeking broader collaborations

Collaboration isn’t just more common: it takes place over longer distances. Indeed, UJ professors collaborate with colleagues all over the world. Increasingly researchers are becoming more strategic about making connections, rather than relying on ad hoc meetings from a conference. As Professor Strydom says, “We need to identify potential collaborators who will help ‘drive’ the project, not be ‘passengers.’”

UJ uses the rich functionality of Elsevier’s Research Intelligence portfolio at every stage of establishing collaborations.

Choosing the best possible collaborators

For Professor Strydom, the use of solutions “such as SciVal...such as Scopus...comes into its own when you are seeking to inform yourself about what are the areas of expertise of someone with whom there might be an intention to collaborate.” Scopus and SciVal allow researchers to build a list of potential collaborators with similar research interests. They can then evaluate each potential collaborator through simple and

more sophisticated metrics and analyses to accurately understand and compare them.

Library Director, Professor Maria Frahm-Arp expands on this further by adding ScienceDirect to the equation: “These packages [ScienceDirect, ebooks and backfiles, Scopus, and SciVal] are so helpful because they really help us to streamline that [by delivering information quickly, correctly and in a user friendly way] and pool information from all these different areas. We are then able to see trends.” For example, “You can see that Joe Smith in Ohio, USA, has published research on carbon emissions. Yet most of his articles are being read by this group of people in China or that group of people in India.”

“And then,” she continues, “we can ask, ‘Who is using this research? Who is downloading his articles?’ These are questions we couldn’t ask before we had solutions like SciVal.

“Now the collaboration process becomes streamlined.” A researcher can say, “Those are the scientists who are interested in what I’m doing.”

For UJ, Professor Frahm-Arp sees the library as an integral part of the research process: “It’s the librarians that really understand how these metrics work, how...SciVal works, for example.” She adds, “As academics start to work more in groups rather than as individuals, we start to see librarians being part of that group. So using SciVal, librarians can help make connections with other research teams by identifying current research that is being done in the same area.”

¹Bordons, M., Aparicio, J., & Costas, R. (2013). Heterogeneity of collaboration and its relationship with research impact in a biomedical field. *Scientometrics*, 96(2), 443–466. doi:10.1007/s11192-012-0890-7



The image above shows the institutions collaborating with University of Johannesburg globally.



Paradigm 3: Information overload with exponential growth in noise and knowledge sharing

Researchers experience extreme time pressures, especially when their university aims for increased recognition as a center of excellence. They need to cut through the sheer volume of available knowledge, so they can find trustworthy information that is directly relevant to their research.

“I’m grateful for Elsevier,” says Professor Henok Kinfe, Department of Chemistry at the Faculty of Science. “Their innovations make our life easier.”

In particular, the AI [Artificial Intelligence] tools in these databases allow researchers to retrieve and display information that would not be possible otherwise.

Dealing with research information overload

To take just one example, researchers can easily feel overwhelmed as they embark on an interdisciplinary literature search. They’re seeking contextual background and, at the same time, encounter unfamiliar terms from a distantly related discipline. ScienceDirect supports the research process not only by simplifying searches, but also by identifying unexpected connections through customized recommendations and alerts.

“There’s going to be a lot of information coming out,” says Professor Kinfe. “So, looking for the specific information you need might take longer. Finding and filtering the right information that you want might be a bit more challenging.”

ScienceDirect helps address these concerns for UJ researchers like Professor Kinfe, as they can find interdisciplinary connections through customized recommendations and alerts. In particular, researchers can obtain overviews of subject areas through ScienceDirect’s Topic Pages.

Topic Pages curate contextual information from books and hyperlinks the content to current journal articles. With just a few keystrokes, researchers get a report that would otherwise require them to spend weeks in the library to generate, with the key points distilled into one easy-to-access source.

“It’s really difficult to imagine life as a researcher today without those databases giving us information that we need in a matter of seconds — and it’s information that we wouldn’t have been able to get in the old-style way. But now, you type a keyword and the database gives you everything you need.”

—Henok Kinfe,
Professor of Chemistry

Conclusion: Answering tomorrow's questions today

Elsevier's tools don't just help researchers and research managers with today's challenges, but make it easier for them to ask questions that have never been asked before. Researchers can respond to trends and blaze new trails, and research managers can lead with strategic data-driven decisions. Databases are constantly being updated to reflect contemporary information as well as new ways of doing research.

For example, Professor Frahm-Arp predicts, "research is not going to be limited to what is being published, but will now extend to policy documents and social media. Researchers will ask themselves, 'What unpublished raw data is out there?' It's an incredibly exciting space."

Moving forward, UJ will increasingly be invited to share the university's expertise with government and industry.

"Like many institutions, we are very focused on the Fourth Industrial Revolution. That means we're also looking across very many different disciplines.

"So people from philosophy to engineering all have a part to play because the Fourth Industrial Revolution isn't just about a whole lot of new apps for your phone. It's really a revolution that is changing what it means to be human."



“We actually don’t really know what we’re preparing our students for. So what we need to be doing is preparing our students to find information, analyze that information, critique it and do something new with it. And that’s very different to 50 years ago where a lot of people thought that education was about learning the facts about something.”

—Professor Maria Frahm-Arp,
Library Director

SciVal

A web-based analytics solution with unparalleled power and flexibility that provides comprehensive access to the research performance of over 14,000 research institutions and their associated researchers from 230 nations worldwide. SciVal allows you to visualize your research performance, benchmark relative to peers, develop strategic partnerships, identify and analyze new, emerging research trends, and create uniquely tailored reports.

Scopus

Since 2004, Scopus has delivered a comprehensive overview of the world's scientific research output across all disciplines. And it's only getting better. Scopus features smart tools to track, analyze and visualize research—all so researchers can identify emerging trends, increase the visibility of their research, build a collaborative network, bolster funding applications and articulate the value of research at your organization.

ScienceDirect

Built on the widest range of trusted, high-quality, interdisciplinary research, ScienceDirect helps researchers find answers to their most pressing research questions, stay on top of their field and gain in-depth insights into trending research topics as they take their next steps in discovery.

ScienceDirect Topic Pages

Combining cutting-edge technology and essential content, ScienceDirect Topics is a research enhancement that brings the path of discovery to the user. ScienceDirect Topics reveal succinct and selected contextual information from reference books, surfacing valuable content when and where it is needed in the research process.

To schedule a consultation, contact:

elsevier.com/research-intelligence/request-a-consultation

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