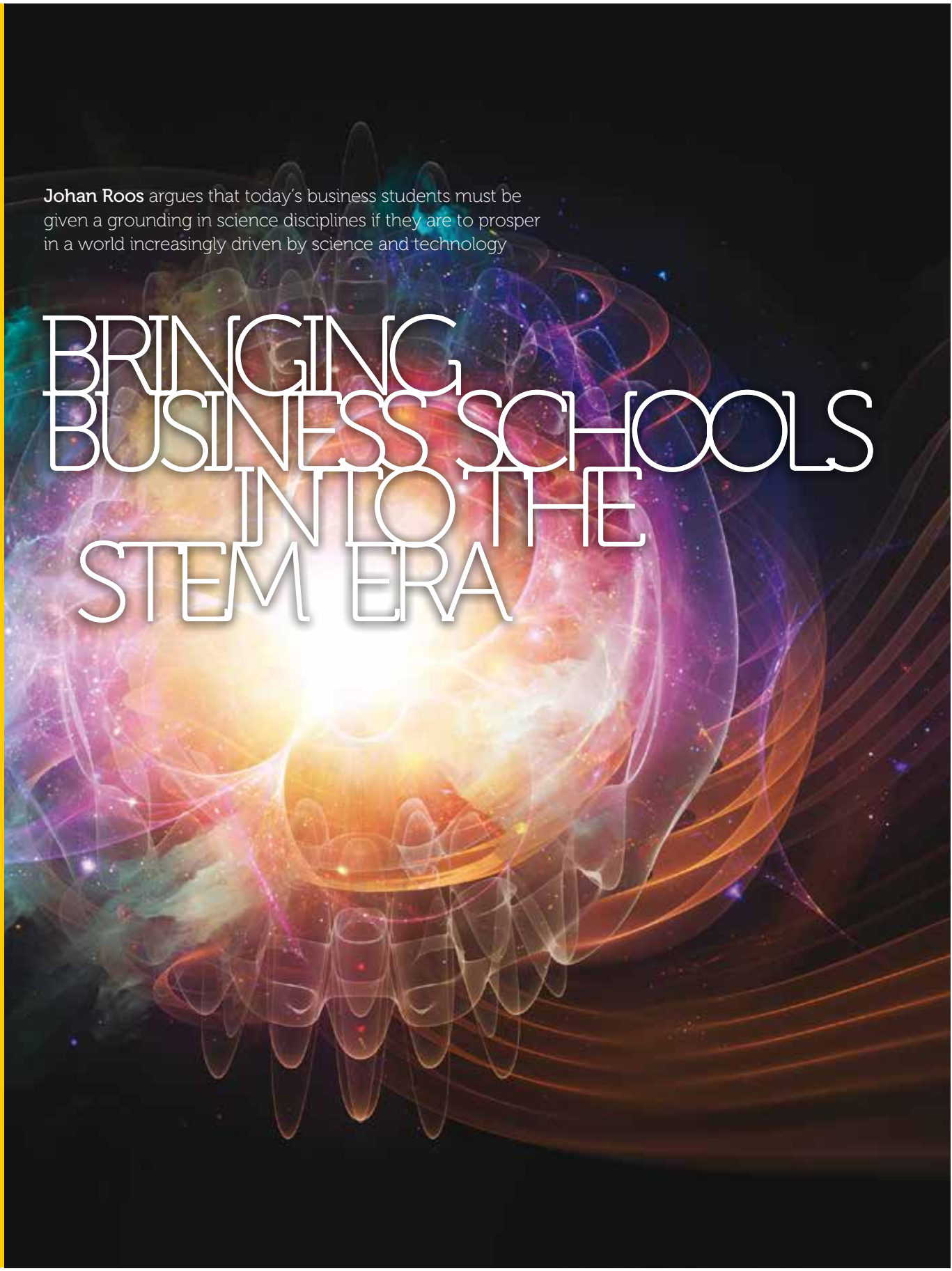

Johan Roos argues that today's business students must be given a grounding in science disciplines if they are to prosper in a world increasingly driven by science and technology

BRINGING BUSINESS SCHOOLS INTO THE STEM ERA

Science, technology, engineering and maths (the so-called STEM subjects) are the driving force behind the most promising and lucrative businesses of the future. But turning such developments into commercially successful innovations requires people who understand STEM as well as organisation and management.

Gone are the days when an MBA generalist with a strong marketing education could fathom the potential of new businesses creating products and services to utilise STEM advances. Today's managers need a solid business background but also the knowledge of the innovative potential deriving from their company's progress in STEM fields.

In the March / April 2015 issue of AACSB's *BizEd* magazine a series of well-written and persuasive articles argued that business schools ought to be reaching out aggressively to STEM students to attract them into dual-bachelors or MBA programmes specifically designed for them.

I agree and praise all these initiatives and am implementing them myself. For example, in my own business school, Jönkoping International Business School (JIBS) in Sweden, we are launching a new masters programme in Engineering Management for engineering students, starting this autumn. Soon after we opened it for applications this spring, the programme quickly filled up with incoming students from many countries. In addition to learning about organisations and management such programmes complement the natural science way of *explaining* reality in *objective* ways with the more social science approach of *questioning* and *changing* reality in *subjective* ways.

However, I want to argue on behalf of a *complementary* view about what business schools should be doing to ensure that our students are prepared for the management and leadership jobs of the future.

I am convinced that business students need to be "conversant in STEM" if they are to have the intellectual capacity and skills to survive in the technology-driven organisations of the future. We can no longer produce responsible graduate business students who are ignorant of basic vocabulary and syntax in the STEM fields.

They at least need to be aware of recent advancements in multiple fields, ranging from genome coding via nano-enabled engineering to the explosive (and controversial) developments in artificial intelligence. In addition, considering that all of these subjects are moving at breathtaking speed, with the borders between them becoming hazier, we are already behind in preparing business students for the jobs that will exist in the future.

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x3

Over the past 10 years, growth in STEM jobs was three times as fast as growth in non-STEM jobs, they are projected to grow by 17.0% from 2008 to 2018, compared to 9.8% for non-STEM occupations

Meanwhile, STEM-related jobs have been leading the jobs growth and are predicted to continue doing so in the future. A 2011 US Department of Commerce Economics and Statistics report states that "over the past 10 years, growth in STEM jobs was three times as fast as growth in non-STEM jobs. STEM occupations are projected to grow by 17.0% from 2008 to 2018, compared to 9.8% for non-STEM occupations".

The Great Recession has affected many such estimates –a 2013 report from the IEEE Spectrum claims that there is no longer a shortage of STEM graduates because of the economic downturn – yet it is clear to us in the world's business schools that the future growth of STEM-involved organisations will always require qualified leaders and managers.

Rather than just having business schools attract STEM students to dual business degree programmes or a token programme for engineers, I argue that every business school student must begin developing STEM literacy. Here are seven ways this can be accomplished:

No.1

In the heyday of liberal arts studies many US colleges required their undergraduates to take a battery of courses in every division of study—humanities, sciences and social sciences. Some of these schools offered "survey" courses in each division to ensure students walked away with a "Renaissance" education, knowing something about everything so as to become a literate citizen.

We should borrow from this pedagogical insight and begin to offer our students a "STEM survey" course. Such a course would help students understand the fundamental challenges in many leading STEM fields – such as neuroscience, nano-technology, biomedicine, material sciences, synthetic biology, astrophysics, artificial intelligence, robotics and many others – and introduce them to the scientific principles and vocabulary they would need to be literate in those fields.

No.2

Business schools would also create new projects that involve both business and STEM students, so both types of students learn how to understand each other's jargon and how to work together. This will help STEM students themselves gain business experience while helping business students begin to understand some of the STEM challenges of their cohorts.

What I have in mind is not so different to what engineering students at Harvard recently were asked to accomplish in a class. As reported in a recent *New York Times* article "Learning to Engineer a Better Brisket", students were challenged to develop a new barbecue grill that would cook meat more evenly than existing barbecues.

Students had to study not just the principles of heat transfer but the manufacture of ceramics, engineering design of grills, the chemistry of cooking meat, the business of starting a competitive new company in a crowded market, and even programming and designing an app (the grill keeps the chef informed of the cooking temperature via a mobile app, which can also be shared among guests invited to the meal).

Harvard is patenting the students' final design and several students are starting a company to create other new grill designs. While this course was for engineering students, it could have equally been conducted for business students to teach them the engineering concepts—with assistance perhaps from an engineer to build the product for them.

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"Designed as an elective in our masters programme, the course "Bringing high-tech innovations to market" offered students an opportunity to learn about nanotechnology and use their entrepreneurial skills in this advanced technology field

No.3

Although the case study method has recently been under much criticism for not adequately preparing students for real world practice and contexts, case studies could prove very helpful to familiarise business students with many STEM concepts.

Case studies could be aimed at generalist business students, for example, to teach them about the challenges of specific STEM industries, such as R&D methods in high technology, risk management in new biomedical fields, or intellectual property concerns in molecular biology and so on.

Students would get the opportunity to study how actual company leaders had to solve problems in managing highly innovative, speculative STEM industries, which are usually very different to managing traditional manufacturing industries.

No.4

Schools should arrange internships for students at STEM companies and organisations. At my school, JIBS, we have experimented by sending students to the London Centre of Nanotechnology (LCN) in the UK, a joint venture between Imperial College London and University College London (UCL).

Designed as an elective in our masters programme, the course "Bringing high-tech innovations to market" offered students an opportunity to learn about nanotechnology and use their entrepreneurial skills in this advanced technology field. Students who participated in the pilot course in 2014 worked with scientists at LCN on live cases utilising patented nano-technology.

JIBS students were paired with LCN post-doctoral researchers and had to get a basic grasp of the technologies involved and work out how to help the scientists commercialise their patented nano-tech applications. They wrote business plans and presented their joint ideas to the programme leaders.

The project's outcomes included business plans for a new type of Protein Chain Reaction machine, a new grapheme-based ink for the photovoltaic market, and a new diagnostic tool to quickly detect bacterial, viral and fungal infections. The overall learning for the JIBS students was that nanotechnology is also about hands-on engineering and innovation and no longer science fiction.

No.5

We also need to create new types of business courses specifically focusing on the key challenges of STEM businesses today. They include how to bring advanced innovations to market, manage and communicate with natural scientists and researchers, comprehend the policy and regulatory context in STEM fields, ethics and the shared responsibility for our societal common good as well as understanding the evolving language of STEM-based innovations.

No.6

New joint degree programmes could be developed to entice STEM-minded business students, just as STEM students are being courted to take joint business or even mixed STEM and management degrees.

There are certainly talented business students with extensive backgrounds in the sciences, mathematics or technology who may not want to be scientists or engineers but who could benefit from a joint degree.

One could even encourage high school students to apply for these joint degrees. It would also benefit industry and academia to begin promoting joint STEM/business programmes to younger students, giving them a glimpse of how their interests in business and/or science can go hand in hand.

No.7

Finally, working with the other end of the scale we also need to involve more PhD students at business schools to research, engage with and write their theses about a STEM field. Business schools worldwide have a goldmine of talent among their faculty and PhD candidates who can perform top-notch research for STEM industries and produce research that has practical results.

In the *BizEd* article series, the authors of "Plotting a Course for STEM" write that "distinctions between STEM and non-STEM disciplines are rapidly disappearing in companies in every sector—and that means that business schools should be part of the STEM conversation. The movement is already there but is coming from the other end of the candle. Many articles have argued about bringing STEM students into business but we need to burn the candle at both ends. We need to bring business schools and their students into the STEM age".

I agree wholeheartedly and am working diligently to take steps in this direction.

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ABOUT THE AUTHOR

Dr Johan Roos is Dean and Managing Director of Jönköping International Business School (JIBS) in Sweden where he also holds a professorship in strategy. He has been a senior faculty member at a number of leading European business schools. He has an MSc in Agriculture and a PhD in International Business. In 2011 he was elected to become a member of the Danish Academy of Technical Science (ATV) and is currently serving on the steering committee of Medicon Village in Sweden.