The manufacturing sector's response to the lack of appropriate technical expertise in South Africa

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Introduction

Industry dissatisfaction with 21st century engineering graduate abilities is a global concern when employers across 42 countries cite 'lack of required technical skills' as the key reason for not hiring graduates (manpowergroup.com 2015). This may explain why South Africa (SA) – which was included in the survey – saw 10 000 technicians as unemployed in 2012, and 31.2% of all Science, Engineering and Technology graduates of the Western Cape universities (CHEC, 2013), despite the ostensible scarce skills crisis (Du Toit & Roodte, 2008). In attempting to address graduate inability to 'apply knowledge' (Griesel & Parker, 2009), we see increasingly practice-orientated educational initiatives, such as project- and problem-based learning, and the compulsory Workplace Learning (WPL) period for University of Technology (UoT) students. However, 65% of the latter are unable to find WPL positions (Mutereko & Wedekind, 2015). The unacceptably low number of graduates thus available for employment and the perceived deficiencies of existing graduates have a significant impact on how the SA engineering sector responds to their human resource (HR) needs.

An ongoing research project investigating engineering practices seeks to provide theoretically-informed, empirical insights into what it is that employed UoT engineering graduates actually do and are expected to do in the field. The intention of the research is to be able to respond more effectively to the education-to-profession 'articulation gap'. Based on 34 comprehensive case studies to date, this paper presents three different approaches taken by the manufacturing sector in response to the 'technical skill deficiencies' crisis in the Western Cape region.

Objectives & methodology

Over the course of seven years a wealth of data has been gathered on three different research projects designed to understand engineering practice at industrial sites. The methodologically pluralist studies draw on semi-structured video interviews, participant and company profiles, "records of discussions, chance conversations, … observational notes, … and quantitative data" (Case & Light, 2011, p. 195). One common complaint to emerge from employers is the lack of local expertise in high-end automation technologies, particularly where new technologies present a great deal of uncertainty (Leonardi, 2011). The added pervasive lack of accurate documentation (Briand, 2003), and inability of (usually) international suppliers to understand different contextual applications result in significant challenges for local manufacturers. This paper looks at how three different companies respond to this challenge.

Theoretical tools

A useful analytical tool - developed from the Legitimation Code Theory (LCT) *Specialization* concept of *epistemic relations* (Maton, 2014) – is the *epistemic plane.* This is a graphic way of representing the relationship between a phenomenon (what) and its approaches (how) in any particular knowledge practice (figure 1). The two axes – *what* and *how* - are strong/weak continua which give us four quadrants. The strongest quadrant *(purist*) sees an unambiguous 'what' and 'how' in that the phenomenon being addressed is commonly accepted and has standardised protocols. The weakest quadrant sees an ill-defined phenomenon with open-ended approaches. The alternate quadrants represent either strongly bounded phenomena with multiple approaches or strongly bounded procedures that could apply to any phenomenon. In this paper, the *epistemic plane* is applied to how companies approach 'the lack of technical expertise'. The *purist* quadrant represents the firm belief in expert knowledge and protocols; the bottom-right (*doctrinal*) sees decontextualized training-for-training's-sake; the bottom-left quadrant sees the foregrounding of existing company capacity and needs (*knower insight*).

Different approaches to scarce skills shortages

Company A is a large automotive component manufacturing branch of an international company. Their priority is to remain productive and competitive. So, to avoid local operator error, they increasingly integrate situation-specific automated systems, even when the most cost-effective solution is operator training. Their approach suggests a lack of faith in the ability of existing employees to adapt or acquire new skills. The second case – machine builders (B) - sees a firm belief in expert knowledge and practice (*purist*), which requires standardised application in multiple contexts (*doctrinal*). Company B is a SA company, but has begun to move most of its manufacturing activity abroad, citing the lack of local expertise. In contrast, a local beverage production company (C) has explicitly begun a training programme that recognises the dire need to upskill local capacity (*knower insight*), not only technically, but also acknowledging that "there is a need for developing understanding in the longer term".

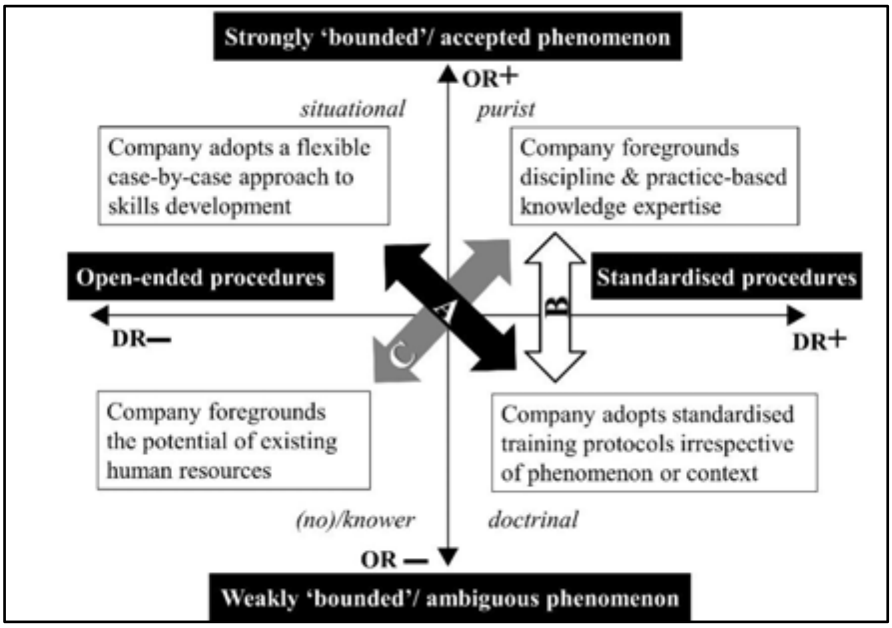

Figure 1. The *epistemic plane* – company approaches to technical expertise

These industry examples of how manufacturers approach the lack of technical expertise present useful insights for educators. Firstly, the *epistemic plane* highlights the significance of *different* approaches to contextual problem-solving, whether HR or technical. Applied to curriculum and pedagogy, the analytical tool could aid in shifting our perspectives on *how* we teach *what*. Secondly, the data suggest that Higher Education faces the challenge of regaining industry's trust in our potential ability to equip graduates. This can only be accomplished through better education-industry collaboration. Much is at stake should we fail.

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