



The Shifting Boundaries of Artisanal Work and Occupations

Angelique Wildschut and Tamlynne Meyer

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- Mechatronics (OFO code 671203) in the automotive sector (Conducted by Carel Garisch and Tamlynne Meyer)
- Electricians (OFO code 671101) in the mining sector (Conducted by Xolani Ngazimbi and Tamlynne Meyer)
- Millwrights (OFO code 671202) in the metals sector (Conducted by Nicci Malleson and Joan Roodt)

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Theme and project leader

Angelique Wildschut

Project team

Tamlynne Meyer, Joan Roodt, Nicci Earle-Malleson, Carel Garisch, Xolani Ngazimbi

PREFACE

The apprenticeship system has been allowed to deteriorate since the mid-1980s, resulting in a shortage of mid-level skills in the engineering and construction fields.

Re-establishing a good artisan training system is an urgent priority. (White Paper for Post-school Education and Training, DHET, 2013)

Many would argue that artisanal occupations are in crisis in our country. There are widespread claims about the shortage of artisans, and the ability of our technical and vocational education and training system to produce the required quantity and quality of artisans is under question. However, while all agree that increased artisan development is important, there is substantial disagreement on the scale and nature of demand for these skills. In other words, we know it is important to foster and grow the systems of artisan skills production (Kruss et al. 2012), but we lack clarity on the nature of the skills required. How many artisans, exactly are needed, in which areas, at which levels and in which configurations within differentiated workplaces?

Our lack of certainty about the nature of demand is exacerbated by confusion about the nature of the supply of artisan skills. There appears to be confusion and inadequate knowledge in relation to the varied routes to artisanal skilling and the extent of the contributions made by the different routes, as well as poor understanding of the issues underlying quality and success in the production of qualified artisans. These factors contribute to widespread assertions that artisan and mid-level skilling continues to be a key gap in the post-school sector (Kraak 2012).

Within this context, the Department of Higher Education and Training (DHET) initiated the Labour Market Intelligence Partnership (LMIP), with the Human Sciences Research Council (HSRC) leading a research consortium to support the development of an institutional mechanism for skills planning in South Africa. The issue of artisans was identified as a key focus area. However, the playing field has changed, and our responses to address artisanal skills production and retention challenges have to as well. Over the last three decades, there have been extensive changes to the nature of work, the increasing impact of technology, changes to work organisation, and the emergence of new fields and forms of practice. In addition, our country has a complex history of vocational education and training (VET) characterised by gender, race and language inequalities. Not only do such aspects hold implications for our understanding of artisanal work, but how can and should we plan for artisanal skills in such shifting occupational contexts?

It is clear that improving our ability to plan for artisanal skills requires a better understanding of the contextual issues that impact on the extent, nature and location of demand and supply of artisanal skills. Critical questions to direct such an endeavour would thus be: How have historical patterns shaped the nature of artisanal training and work today? How can planning for artisanal skills respond to the changing nature of work and the division of labour in the workplace? How can planning be responsive to innovation and change?

To engage with these questions towards better understanding such a complex and multilayered context (occupational milieus and identities), three

projects were developed to investigate: the underpinning history (Mbatha et al. 2015), changes to the nature of artisanal work and its organisation (Wildschut et al. 2015), and changing intermediate knowledge bases and the resulting implications for future artisanal work and preparation (Gamble et al. 2015). This theme of research is entitled 'Understanding changing artisanal occupational milieus and identities', arguing that changes to the nature of work critically affect the nature and location of skills demand and supply and thus we need to focus more effort on understanding this dimension of our labour market.

This project report on *Shifting boundaries of artisanal work and occupations* relates to the second aspect. It uses the concept of occupational boundaries as a lens to investigate change to artisanal work and its organisation, the focus question being: Has the work of artisans changed and, if so, how? Through qualitative investigation into three selected industry sectors, the project interrogated whether there have been changes to the occupational boundaries between artisans, technicians and professionals.

Drawing from the empirical base established through the research, the project argues that current labour market analysis approaches can benefit from incorporating information on the changing nature of work, because:

- Work change has wide-ranging implications for the nature and location of demand and supply of skills;
- Work is more than just a labour process and the identities and attitudes that individuals have in relation to their work have the potential to impact on the success of skills development and labour-market interventions; and
- Work change and its relation to demand for skills is complex, so more relational approaches (such as the one employed for this study) to understand this relation can add value.

Essentially, the project highlights that in order to better understand and respond to the challenges of contemporary labour markets we need to focus more attention on investigating changes to the nature of work.

A SUMMARY OF KEY FINDINGS

The project attempts to give insight into the changing nature of artisanal work with the main research question being: Has the work of artisans changed and, if so, how? To address this question, sector studies were designed, using occupational boundaries as a lens to capture changes to artisanal work in relation to other occupational groups.

The project undertook qualitative research on selected artisanal occupations in three industry sectors:

- Mechatronics technicians (OFO code: 671203) in the automotive sector;
- Electricians (OFO code: 671101) in the mining sector; and
- Millwrights (OFO code: 671202) in the metals sector.

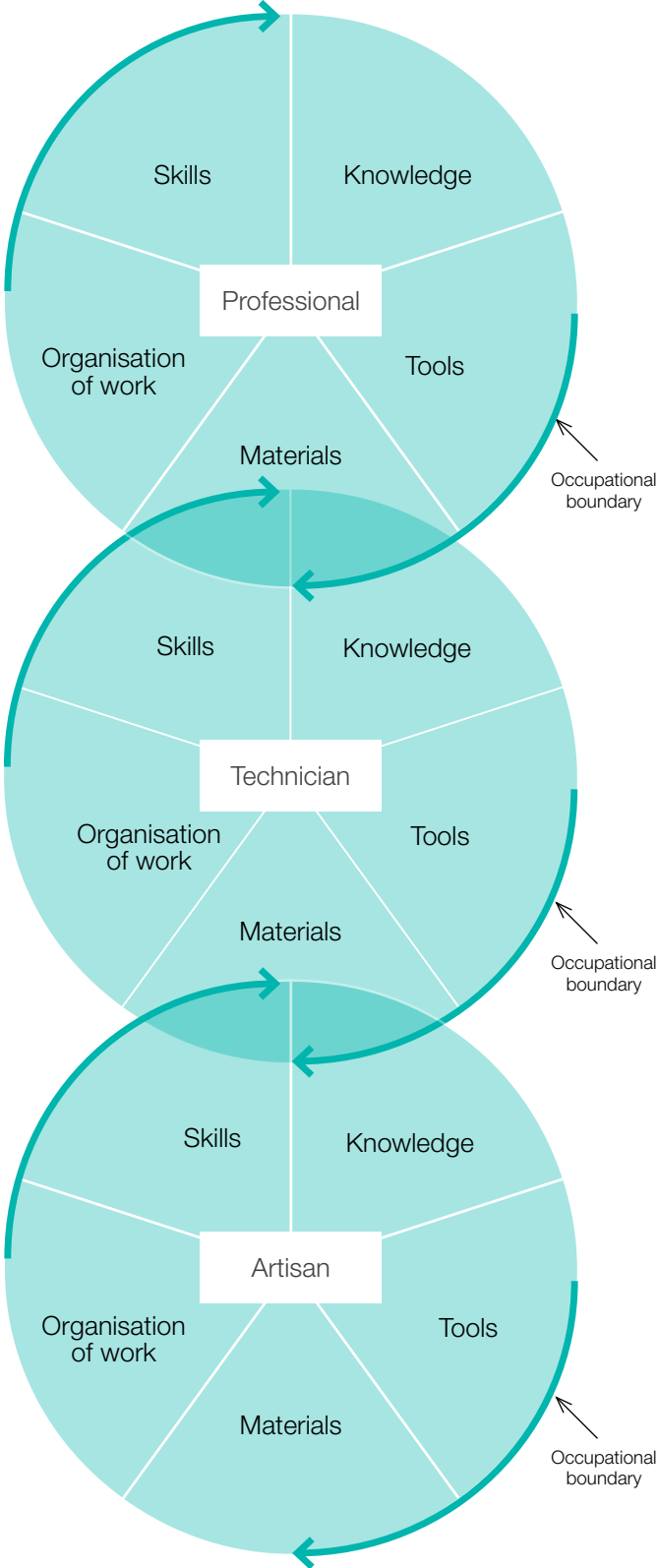
Each case study interrogates whether there have been changes to the occupational boundaries between artisans, technicians and professionals by investigating change to five elements conceptualised as comprising an occupational domain of work: work organisation, materials and tools, as well as the skills and knowledge expected to be held by an individual doing such work. The figure below illustrates the conceptualised occupational domains in relation to one another, as well as the elements comprising such domains. The central idea underpinning the figure is that change to occupational domains occurs in a relational manner, and that is why the boundary between occupations overlaps.

The investigation in line with these key concepts resulted in the following central findings on artisanal work change:

1. **Organisation of work:** Work continues to be organised hierarchically with strict protocols governing interaction and levels of responsibility between occupational groups.
2. **Materials:** The materials associated with artisanal work remain constant and a key contributor to the occupational identity.
3. **Tools:** The tools associated with artisanal work are changing and those falling within the jurisdiction of a particular occupational group are currently being contested.
4. **Knowledge:** There are real and perceived changes to the knowledge required for artisanal work.
5. **Skills:** There are real and perceived changes to the skills required for artisanal work.

This empirical base underpins the overarching and concluding messages towards improving labour market analysis that would inform artisanal skills planning policy and process:

Figure 1: Working conceptual frame for investigating change in the boundaries between occupations



Message 1: It is important to understand the changing nature of work

- Work change has wide-ranging implications for the nature and location of demand and supply of particular skills.
- The relation between work change and demand for skills is complex, with sometimes unpredictable outcomes for demand.

Message 2: It is important to recognise work as more than just a labour process

- The history and sociological discourse of a sector and occupation are pervasive and can impact on the success of labour market or skills development interventions.
- The identities and attitudes that individuals have in relation to their work are mediating factors, with the potential to impact critically on the success of labour market interventions.

Message 3: It is important to understand work change as relational

- Changes to occupational domains occur relationally and this should also be taken into account when assessing the supply and demand of skills.

SNAPSHOT OF CASES



Mechatronics in the automotive sector



Did you know: Mechatronics is one of the newest and fastest growing fields in South Africa?



The supply of mechatronics graduates is increasing rapidly.



In this sector, trades workers make up 24% of the total sector employment (2013).

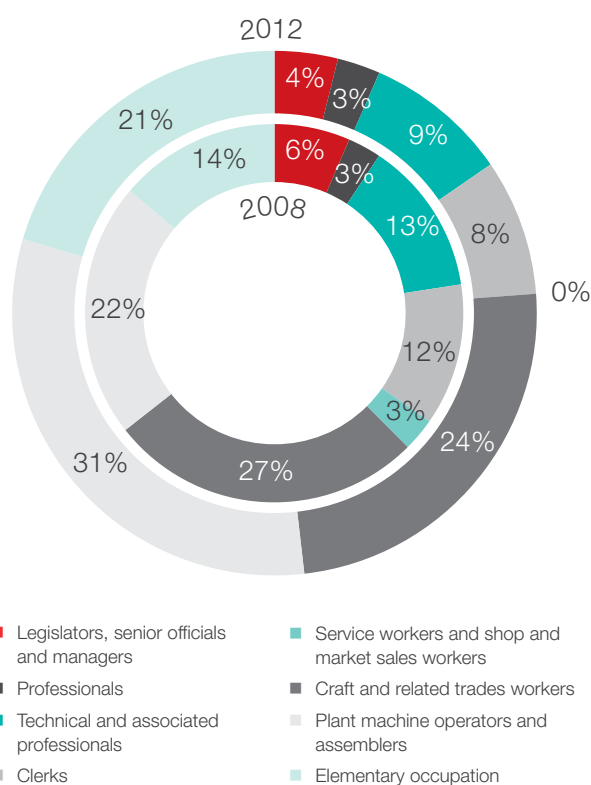


But this represents a 3% decline in proportional share of employment since 2008.



Fact: Mechatronic artisans, technicians and engineers are identified as scarce skills in South Africa in the Manufacturing, Engineering and Related Services sector.

Occupational group share of employment



This is a new and emerging occupational identity with the potential to redefine the notion of artisan.

According to mechatronic employees...

Years ago an artisan was 20/80 – twenty per cent theory and eighty per cent practical – right now I do believe that in order to be successful in your field or in the automation field it needs to be like 50/50 – and even sixty per cent theoretical. (Artisan)

Companies are going to be forced to recognise these people (mechatronics apprentices) at a higher level because of what they are going to be able to do – they are definitely not an artisan any more, and that's why we changed our entry requirements and made it to a higher level just to make sure that we got people who are analytical thinkers. (HR Professional)



Millwrights in the metals sector



Did you know that the millwrights trade is one of the oldest and is viewed as having the highest status amongst artisanal trades?



Between 2010 and 2013, the output of millwright skills has increased rapidly.



In this sector, trades workers represent 35% of the total sector employment (2013).

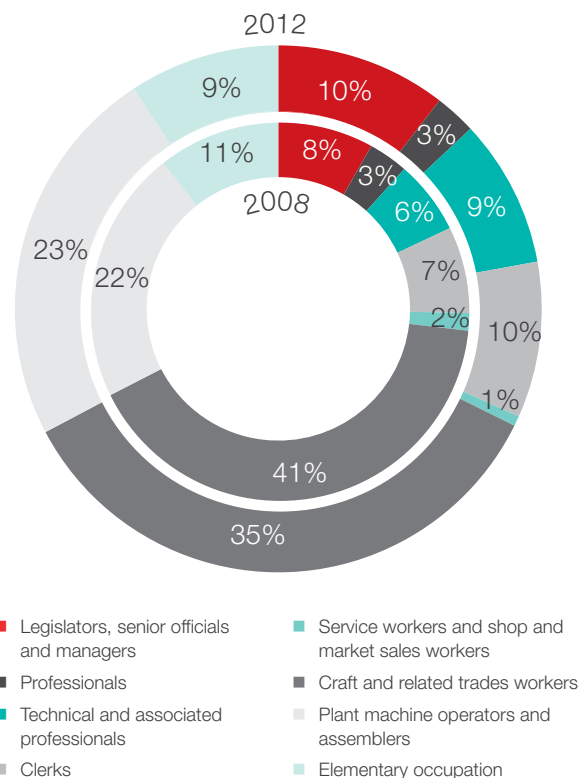


But this represents a 6% decline in proportional share of employment since 2008.



Fact: The millwright trade emerged during the early Middle Ages as a branch of specialist carpenters in response to the need for craftsmen who could design, build and maintain wind- or water-powered mills including flourmills, sawmills and paper mills. Modern millwrights construct and maintain the heavy machinery used in industry.

Occupational share of employment



The occupational identity is under pressure as changes to technology are impacting on the trade's ability to claim status based on assertions of dual-trade expertise.

According to employees in the metals sector...

Even though we train millwrights, our company is not taking millwrights as millwrights ... because you will understand that a millwright it's a combination of two trades mainly fitting and electrical ... but you will be lucky that they take you as a millwright. (Engineer)

We don't need millwrights ... yeah, they are there, but they are working as a fitter or as an electrician. They are also like me ... they don't operate on a double trade. (Artisan)



Electricians in the mining sector



Did you know: In South Africa, training institutions award a national certificate for electrical trades under specialisations that take into cognisance the different types of mining: metalliferous, open cast, surface coal, surface diamonds, underground coal and underground diamonds.



The supply of electrical skills at the professional and technician levels is declining in comparison to increases at technologist levels.



In this sector, trades workers comprise 32% of employment.

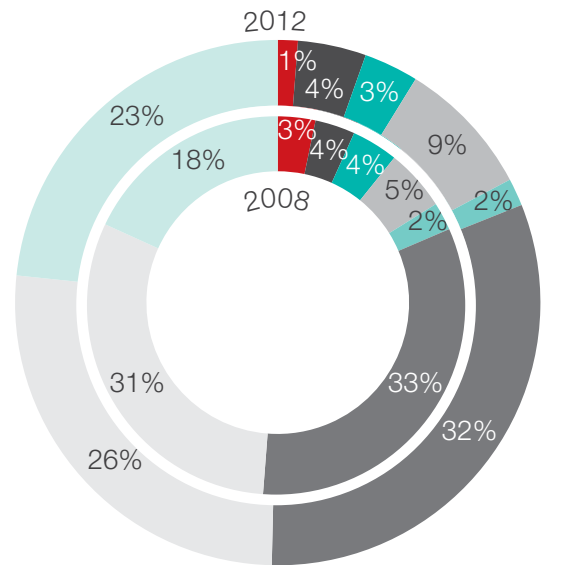


This is basically consistent with their proportional share of sector employment in 2008 (only 1% decline).



Fact: Electricians in the mining sector are referred to as industrial electricians.

Occupational share of employment



- Legislators, senior officials and managers
- Professionals
- Technical and associated professionals
- Clerks
- Service workers and shop and market sales workers
- Craft and related trades workers
- Plant machine operators and assemblers
- Elementary occupation

This is an occupational identity strongly influenced by the historical discourses and inequalities about artisanal work and training in the sector.

According to an electrical apprentice and an artisan...

I think a lot of people still think of themselves as white and black as that mindset hasn't changed ... they (Blacks) see them (Whites) as better than them ... because he is white they assume he has got power.

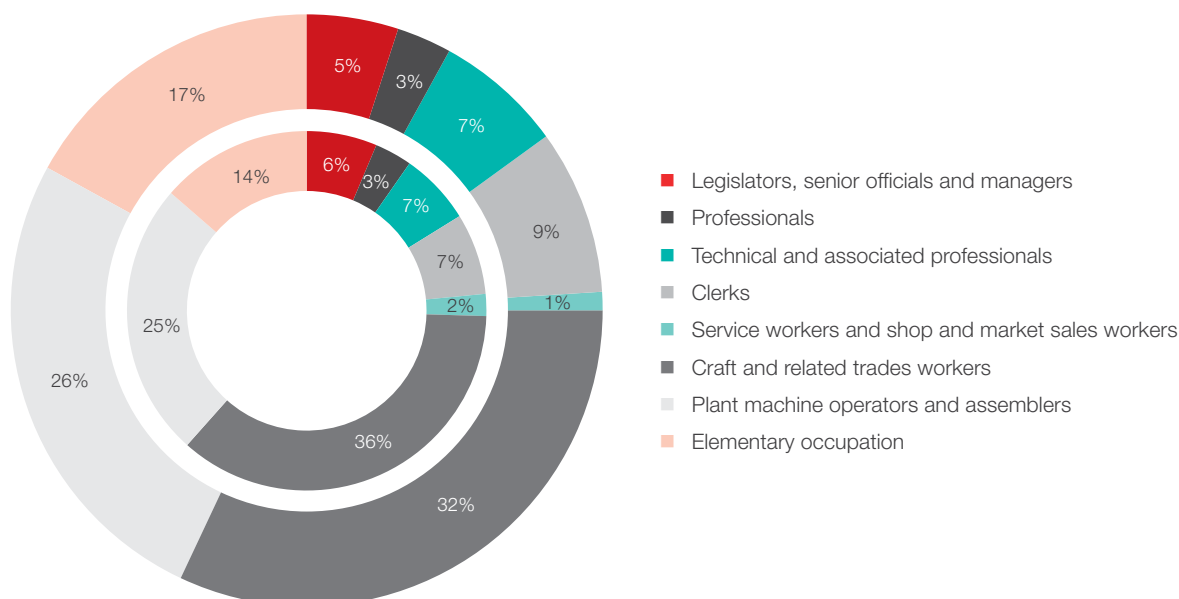
Let's say, you know racism, it will always be there in the mines. There's lots and lots of white people so, somewhere, somehow, yeah, they won't treat you nicely.

INTRODUCTION

The social and political conditions – the milieu within which artisans are required to work – have shifted globally and in South Africa since the end of apartheid. The policy concern is to train larger quantities of artisans and improve the quality of artisanal skills, while at the same time opening up more opportunities for young, black and women artisans to shift historical trends of unequal access and success (RSA 1998). This is evidenced in a wide range of policy and initiatives aimed at improving and expanding the Technical Vocational Education and Training (TVET) system, improving the status of artisans to encourage more individuals to enter into artisanal training and employment, and improving and streamlining the quantity and quality of artisan data in the country (DHET 2012a, 2012b, 2015).

Data on the employment of crafts and related trades (CRT) workers (the occupational group where artisanal employment is recorded), however, indicates that the labour market for artisans contracted between 2001 and 2012 (Bhorat et al. 2013). The same labour market data for the three sectors selected for this study confirms this trend, although for a shorter period of time (2008–2013). Figure 2 shows that CRT workers have seen a decline in proportional share of employment from 36% in 2008 to 32% in 2013. What makes this information noteworthy is that the mining, automotive and metals sectors have historically been strong employers of artisans.

Figure 2: Change in occupation share of employment in the mining, automotive and metals sectors, 2008 (inner circle) – 2013 (outer circle)



Source: LFS (2008–2013)

This causes an apparent disjuncture between policy-driven imperatives to increase and accelerate the production of artisans and the ability of the South African labour market to provide employment. Of course, this analysis has limits. It does not take into account the opportunities for artisanal employment that might arise out of the informal labour market.¹ It assumes that past employment trends are good predictors of future employment trends. And it does not take into account the changing nature of work and how this would affect the nature of current and future demand for artisanal skills.

This project engaged particularly with the last concern, through investigations into three artisanal trades in South Africa that are undergoing different facets of change. One is a new and emerging multidisciplinary field of practice recently recognised as a trade (mechatronics in the automotive sector), the other a traditional trade having to function in more technology-driven work contexts (electricians in the mining sector), and the third a high-status trade also having to contend with the implications of increased application of technology (millwrights in the metals sector).

Analysing changes to artisanal work and occupations across these cases highlights the importance of:

1. Understanding changes to the nature of work;
2. Acknowledging the sociological nature of work; and
3. Approaching studies of work change from a relational perspective.

The report is structured in three sections, providing the evidence to support these claims. First, the conceptual frame and methodological and design considerations are presented. This shows how an occupational boundary was conceptualised and how the conceptual frame sets up the categories for analysis of change to the nature of artisanal work. The second section presents the synthesised findings across the cases on the nature of change to artisanal work and occupations in terms of knowledge, skills, materials, tools and the organisation of work. The final section returns to the overarching insights for labour market research and analysis, as well as for national artisan development and skills planning (referred to in points 1–3 above).

¹ Although, drawing from data between 2005 and 2011, indications are that CRT workers have experienced a decline in proportional share of employment in the informal South African labour market as well (Mbatha et al. 2014).

1. BOUNDARIES AS A LENS FOR ILLUMINATING CHANGE TO THE NATURE OF ARTISANAL WORK

First, the term artisan or artisanal work is briefly clarified. The most simplistic understanding of an artisan is an individual who is skilled at practising a particular trade or handicraft, which has become regulated – in most cases, by belonging to a guild (formal association). The training is characterised by vocational education combined with extensive practical training and experience. Although an artisan may do mainly manual work, it is recognised that this draws from an extensive technical and practical knowledge base combined with considerable experience in the practice of the relevant trade. Traditionally, the work of an artisan was associated with crafts, but later also included the skilled manual labour involved in manufacturing-related trades. This is the most dominant understanding of artisanal work in South Africa. South African artisans also differ from some of their international counterparts in that they do not benefit from an overarching body for regulation.

Finally, artisanal occupations in many other countries also struggle with strong racial, gendered and, less so, language prejudice in artisanal work, but the South African case differs in that in the past this discrimination was politically sanctioned (Mbatha et al. 2014). This history has left a particular scar on the notion of the artisan in South Africa that continues to contribute in sometimes unexpected ways to the inferior status associated with such work.

1.1 The tides of work change

This national context is critical, but wider forces are also of relevance when considering how to respond to challenges for the production and employment of

artisans. Work has changed, is changing, and will continue to change, but the increasing pace at which this is happening has led many to assert that we need to assess more regularly the implications for understanding and responding to the challenges of contemporary labour markets (Burke & Ng 2006; Burns 2007). In addition, some argue that work is not only changing more rapidly, but with increasing complexity (Heerwagen et al. 2010). Some of the key changes to work include increasing globalisation, the impact of technology (automation and mechanisation), the nature of employment (from full-time to shorter-term, contract-based jobs), the bigger role played by organisations (Muzio et al. 2011), less hierarchical and standardised forms of work organisation, and the identity and values of workers (Schmid 1995; Wildschut et al. 2015).

The point is simple: there are changes to work that can result in change to the occupational scope of practice and its associated knowledge and skills (Castiglioni 2015; Bailey 1990) – the traditional boundaries of the occupational group, as it were. It is thus imperative to engage critically with how work change translates to change for different levels of work, as this holds implications for demand and supply of skills. To capture and analyse such change in artisanal work, the project adopted the lens of ‘boundaries’ between occupational groups. Next, we clarify how such boundaries were conceptualised.

1.2 Conceptualising an occupational boundary

The concept of boundaries is well established and has been extensively applied to investigate various

forms of sociological and institutional change (Lamont & Molnar 2002). As this project focused on the ways in which boundaries between occupations are manifested in the work context, the conceptual frame was informed by studies on professions and work (Abott 1988, 1995; Freidson 1989, 2001) as well as science, disciplines and knowledge (Gieryn 1983, 1999; Star & Griesemer 1989).

As the right to supply certain collections of skills, services and knowledge to society holds monetary and status rewards, it is not surprising that there will be competition over these domains. Occupations constantly try to expand, either vertically or horizontally, their claims towards rights to offer a collection of skills, knowledge and services (also referred to as jurisdictional claims) in the labour market. Established professions such as medicine, law and engineering are examples of occupations that have been successful in establishing and defending their occupational jurisdictions. Occupational boundaries are thus critical in establishing control over knowledge and/or practice domains in a labour market. Fournier (2000) indicates two processes crucial for establishing such control:

- The constitution of an independent and self-contained field of knowledge as the basis upon which to claim/build authority and exclusivity; and
- The labour of division² that goes into erecting and maintaining boundaries between the professions and various other groups (other occupational groups, clients and/lay persons, and the market).

As professions are occupations that have been successful over an extended period of time in claiming exclusive rights to offer certain services and perform certain tasks for society, the contestation of occupational domains is an issue explored extensively in the sociology of professions and work literature. Authors such as Abott (1988,

1995) and Freidson (1989, 2001) are notable in this regard, as well as theorists such as Star and Griesemer (1989) and Gieryn (1983).³ But with professional boundaries increasingly coming under pressure due to extensive changes in the world of work today, interest has renewed around the issue of occupational jurisdiction.

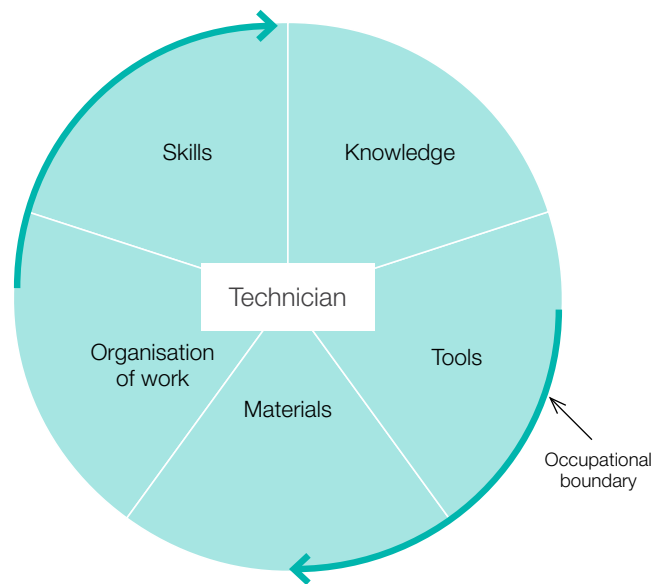
This discussion still tends to predominate in the area of healthcare (Miller 2014; Kroezen et al. 2013; Motulsky et al. 2011; Wakefield et al. 2010; Martin et al. 2009; Barret et al. 2007) and social work (Heite 2012; Welbourne 2009) – but, increasingly, a wider array of fields and occupations is being considered, for example journalism (Lewis 2012) and academia (McMillan 2011). Issues surrounding changes to knowledge, competencies and skills have thus received much attention in the more ‘traditional’ professions, but artisanal occupations have seldom been the focus of such investigation. Vallas’ (2001) work on engineers and skilled manual workers is one of such few. This highlights a clear gap in the literature that studies such as this can start to address.

Based on this literature, a very basic premise is constructed – that an occupational boundary can be understood as a distinction between different types of occupations. It is a distinction that consists of observable elements of a domain of work as well as the conceptual distinctions informing the association of a domain of work with a specific occupational group. Lewis (2012: 7) makes a similar assertion that jurisdiction is about ‘displaying what a profession or occupation knows (its system of abstract knowledge) and connecting that to what the profession or occupation does (its labour practices)’. We conceptualise that occupational boundaries change in relation to shifts in these two aspects. To represent the system of abstract knowledge, we select the concepts of skills and knowledge; to represent the labour practices, we select the concepts of tools, materials and organisation of work. Together, these elements are

2 The idea referred to by Weber (1987) as incommensurability, that professions are not the technical outcomes of the intellectual division of labour, but are constituted and maintained through processes of isolation and boundary construction (Fournier 2000: 73).

3 While Thomas Gieryn (1983) used the term ‘boundary work’ to study how science is and has been demarcated from nonscience, the potential of boundary objects to cross disciplinary boundaries has been emphasised by Star and Griesemer (1989).

Figure 3: Working conceptual frame for investigating change in the boundaries between occupations



selected as delineating the boundary between occupations.

Some of these terms are contested in the literature, requiring clarification about how they are used in this study. A purely practical distinction is adopted in using the terms ‘knowledge’ and ‘skills’ respectively, although we acknowledge that there is a relation between the two that may make distinguishing between them inappropriate in some instances. We wanted to differentiate between changes to expectations of what artisans should be able to do (skill) and what they must know (knowledge).⁴ In using these two concepts, we intend to highlight the symbolic relevance and discursive work that is critical in establishing disciplines and knowledge domains.

However, we also wanted to capture actual work change. Here, literature on work as a labour process becomes useful. This literature suggests that occupational boundary rules are established by the relation between materials, tools and organisation of work. As illustrated in Gamble (2015: 8), ‘work can be described as a labour process that comes about through the relation between the division of labour (or the way work is

organised), the tools or technology used and the materials used [...] this three-way relation was the traditional way of separating one trade from another [and] the value of understanding work in this manner remains undisputed’. Others would add the final product as another important element distinguishing the scope of work of different occupations. But as the occupational groups under consideration for this study worked towards the production of the same ‘product’, we did not adopt this further distinction.

We argue that using occupational boundaries in the way it is conceptualised here, incorporating individuals’ understanding of the skills and knowledge associated with their work, can offer additional insight into work change and its implications. Individual and group perceptions and attitudes about work are an often-neglected area of investigation, but they clearly have a bearing on the labour market (Mncwango et al. 2015) and any political and economic benefits (Burger et al. 2015) that we hope will result from intervention in the labour market.

1.3 A note on methods and design

The project was designed as a set of case studies of key occupational groups in a focus field of practice and industry sector, combining primary and secondary research. We selected this approach as

⁴ The debate on differentiating between knowing that and knowing how is clearly outside of the scope of this report. Theorists such as Ryle (1949) and Russell (1912) are notable in this regard.

case studies make it possible to ‘analyse at a concrete level the interactions among changing markets, changing technology, changing labour supplies, changing skill requirements, and changing educational processes’ (Bailey 1990: 3). This involved occupation-specific literature reviews, organisational document reviews, labour market demand and supply analysis, and individual interviews.

Semi-structured interview schedules were designed to collect a broad range of data related to occupational milieus and labour markets, boundary work, boundary objects and identity, although respondents were allowed to raise additional issues (please refer to Appendix A for the schedules). The interviews were conducted in boardrooms, training centres and workshops on company premises, designed to last between 30 and 60 minutes. All respondents received an information and consent form that detailed the background for the study as well as ethical considerations. This was sent out to respondents beforehand and, at the start of the interviews, any questions to clarify the project and research process were addressed. For accuracy purposes, interviews were tape-recorded and transcribed verbatim.

The computer programme NVivo (version 11) was used to code the qualitative data. Essentially, there were three dimensions of coding. The coding per case was done by at least two researchers to enhance reliability. Firstly, the descriptive data were classified, linking demographic data to each

transcript, so that when quotes were coded at a particular node/theme, this information was included. This made it possible, for example, to search by race and case whether there were identifiable differences in how occupational boundaries were contested. Secondly, we coded for instances where the elements constituting an occupational domain were mentioned. At this level, we only coded for whether a particular piece of narrative indicated change in the field of practice. Here, for example, respondents’ mentioning different technologies used in their work would count as indicative of change to the tools used. Lastly, we coded for whether the quote indicated perceived change to the particular element in terms of the work of an artisan, technician or professional.

1.3.1 Reflecting on the sample

The sample consisted of 94 respondents across five categories: HR practitioners, engineers, technicians, artisans and apprentices.

The sample was dominated by artisans (40%). However, if we combine the categories of apprentices and qualified artisans, individuals involved in artisanal work and training made up the majority of the sample (54%). Engineers also comprised a substantial proportion (24%). The cases each reflect concentration in the province where the sector activities are concentrated (the automotive sector in the Eastern Cape area, the metals sector in Gauteng and the mining sector in North West).

Table 1: Sample distribution by case and category (n=94)

	HR	Engineer	Technician	Artisan	Apprentice	Total
Electricians	1	4	0	15	5	25
Mechatronics	4	7	5	6	8	30
Millwrights	5	12	5	17	0	39
Total	10 (11%)	23 (24%)	10 (11%)	38 (40%)	13 (14%)	94 (100%)

Table 2: Sample distribution by case and region (n=94)

	GTN	NW	EC	TOTAL
Electricians	5	20	0	25
Mechatronics	8	0	22	30
Millwrights	39	0	0	39
Total	52	20	22	94

1.3.2 Three fields of practice

While we cannot delve into all the nuances emerging from each case, it is important to have background about the cases and the particular dimensions of change they were experiencing at the time of the study, before the cross-case analysis. Here, we provide brief summaries to highlight the key areas of change. Appendix B illustrates some key facts about each case, sketching the relevant occupational milieu and identity. The overarching story is one of employment decline nationally, with CRT workers being particularly negatively affected as an occupational group. While the sectoral employment storyline varies, it is clear that employment contraction characterised the milieu of artisans in South Africa during this time. New identities are emerging, but old identities are still part of the construction of present artisanal occupational identities.

Case 1: Mechatronics in the automotive sector

Mechatronics engineering includes the study of electronics, software and mechanical engineering in the design and manufacture of products and processes. Its application combines highly technical and knowledge-intensive fields, such as traditional electrical, electronic, mechanical and computer engineering. It is essentially about the computer control of an electro-mechanical system (Wolff & Lockett 2013), 'affording intelligent functions and features' (Lyshevski 2002: 197) that were not possible or cost-effective before. Mechatronics is seen as an ideal area of expertise central to modern vehicle manufacturing (Garisch & Meyer 2015), thus the automotive sector was selected as an appropriate empirical focus. In South Africa, a dedicated mechatronics qualification at the vocational skills level has recently been instituted, along with recognition as an artisanal trade (DHET 2012).

The main occupational groups working in the mechatronics function area were found to be engineering professionals, technicians, artisans and mechatronics apprentices. Engineering professionals, technicians and artisans are the current mechatronics functionaries, although they would have been trained as generalists. One can thus make a distinction between artisans who are working in the area but qualified in a traditional trade

(electrical or fitting and turning) and the mechatronics apprentices being trained as the ideal functionaries to work in this field at the intermediate skills level. Although mechatronics is still seen as a new and emerging field of practice, traditionally trained artisans have been working in this area. The traditional scope and level of work of artisans and technicians is thus expected to be affected by the entry of this new type of artisan in the field of practice.

Case 2: Millwrights in the metals sector

The work of millwrights includes the construction and maintenance of heavy machinery used in industry. Millwrights must be able to dismantle and overhaul machinery and equipment, requiring the use of hand and power tools, and to direct workers who are engaged in these activities. The millwright must have a thorough knowledge of the load-bearing capabilities of the equipment they use as well as an understanding of blueprints and technical instructions provided in order to assemble machinery. The millwright may also need to use lathes, milling machines and grinders to make customised parts or repairs. Electrical installation of equipment also forms part of their responsibilities and, because of the increasingly automated nature of industrial machinery, so does a knowledge of electronics.

Other skills – such as a good understanding of fluid mechanics (hydraulics and pneumatics), and of all of the components involved in these processes, including valves, cylinders, pumps and compressors – may also be required. Modern standards of practice for millwrights direct the kinds of skill requirements, such as working within precise limits or standards of accuracy with a wide array of precision tools. The main occupational groups functioning in this area were found to be technicians, millwrights and other generalist artisans (fitters and turners and electricians). Over the past few years, the work of millwrights is seen as heavily influenced by changes to the electrical component of their work.

Case 3: Electricians in the mining sector

Electricians working with heavy currents generally specialise in construction of new structures or maintenance work (or both). In new structure

development, electricians primarily install wiring into new buildings, be they residential, commercial or industrial. In maintenance work, electricians maintain, upgrade or repair existing electrical systems. Electricians who work with light currents will typically be involved in electronic engineering where the systems are computer based as opposed to electrical engineering work.

This case is interested in electricians in the mining sector, typically referred to as industrial electricians. Their job involves testing, repairing and maintaining electrical equipment. While basic electrical knowledge is essential to excel within this industry, electricians who are exposed to newer technologies

involving computer-based systems will have an advantage. Within the mining sector, electrical work and training includes baseline risk assessment and basic electricity, panel wiring and circuits, fault-finding and installations, as well as components that make use of newer technologies such as electronics and Programmable Logic Controllers (PLCs). The main groups functioning in this field of practice appear to be electrical apprentices, qualified artisans and electrical engineering professionals. In this case, the position of a technician was not prominent. The main change affecting the work of an electrician appears to be the shift from electrical to electronic work.

2. THE NATURE OF ARTISANAL WORK IN THREE INDUSTRY SECTORS

This section of the report presents the synthesised findings on artisanal work and occupational change across the three trades. Three distinct trends can be identified in relation to the elements conceptualised as reflecting the occupational domain. Firstly, we find real and perceived change to the skills and knowledge required by artisans. Secondly, in line with assertions by others, we find that the tools for artisanal work have changed, with implications for the manual dimension of artisans' work, but it is interesting to find that manual ability remains crucial in constructing the occupational identity. Lastly, although the relation between materials and tools for artisanal work has shifted, the organisation of work plays a critical role in reinforcing the traditional scope of artisanal work in relation to other occupational groups. The evidence for these assertions is described in the next three subsections.

2.1 Real and perceived change to knowledge and skills requirements

Across the cases, we first find evidence for expanded skills requirements, expectations that artisans should have more generic skills that are not traditionally associated with artisanal work. Artisans are increasingly required to plan their work, organise and manage their time, maintenance-related in particular. The timeous identification and procurement of parts required for maintenance jobs thus emerged as critical in defining artisanal work at present. Another general trend in similar vein comprises the re-ordering of parts for those replaced in breakdown situations. These practices stand in stark contrast to the 'old-school era' where artisans simply arrived at the breakdown scene with

their toolbox and walked away upon completion of the repair job, with all administration-related aspects being left to the supervisor and engineer for processing. Additional administrative responsibilities comprise the compiling and presenting of breakdown reports (in team context) as well as handover reports upon completion of shifts. Indicative that more managerial and administrative tasks are seen as traditionally outside of the scope of artisanal work, this respondent asserts that:

[T]he slightest administration work you give them to do; like when they do my maintenance schedules ... that becomes like a nightmare to them. (HR professional, MechCase)

In this changing work environment, artisans are required to take greater ownership for the planning, preparation and post-task administrative responsibilities. This requires higher levels of organisational competence. As is illustrated by the narrative of this respondent:

Production pressures sometimes force you to lose sense of how to organise and then you might get into trouble with your safety or injure yourself and whatever, but if you get your organisational skills right and you start planning, okay! (Artisan, ElecCase)

[W]hatever you are doing you have to do procedurally, for example, you have to change a motor. Before I can change the motor ... that has to be in the log ... they must be able to trace every step back. (Artisan, ElecCase)

Not only have the skills required for artisanal work expanded, but the increasing incorporation of automation technologies is seen to elevate such work in terms of the knowledge and skills required. Artisans are expected to apply and be proficient in understanding the implications of new technologies. In this regard, the Programmable Logic Controller (PLC), Supervisory Control and Data Acquisition (SCADA) systems and – especially in the automotive sector – robots play a large role in changing the nature of artisanal work. As illustrated by this respondent:

[T]he type of person or artisan that we need in th[is] type of environment is a person that is multifunctional – whether it's robotics or systems, mechanical, electrical or whatever. (HR Professional, MechCase)

This respondent concurs:

[Y]our basic electrician does not cut it anymore because he now also has to service your robot ... he has to understand basic PLCs and programming because all of the jigs and fixtures are nowadays running off PLCs. (Engineer, MechCase)

The increased expectation that artisans should be aware of, and have the ability to analyse, different technologies and engage with abstract knowledge in this regard is widely shared, as is shown in the narrative of this respondent:

[I]f, in my work, I read about something or somebody comes ... with a new product or a new type of machine, I have to research it and evaluate it ... can it work or can it not work and if it makes sense. (Artisan, ElecCase)

Another respondent confirms this sentiment:

[T]hey [artisans] need to be able to read a little bit more ... it's no longer about you working with your hands, it's also more about reading papers about different technologies ... to understand what is happening in those areas. (HR Professional, ElecCase)

In the millwrights' case, this trend is exemplified in the incorporation of PLCs as a significant change to production processes that were previously manually controlled. This requires all millwrights to be more technologically skilled in order to remain relevant and the change is seen to expand their work to include more electronic and computerised activities. Some of such changes, as well as the pace of change, are alluded to by these respondents:

[O]n the electrical side new stuff that is coming out like PLC, drives, soft starters, and normally after three years some of the stuff they change, they come with a new design, new software. (Artisan, MillCase)

[W]e're looking at internalising PLC training ... going forward, it is going to be ... included as an integral part of the artisan training. (HR Professional, MillCase)

The same implications apply to the work of electricians. They are expected to be proficient in working with new technologies, where a greater understanding of electronics is a key driver of change. As indicated by one respondent:

what we were actually teaching the guys just a year ago it's totally different ... We've got a lot more of electronics on the system than before ... They have to be more technically skilled. (HR Professional, ElecCase)

The mechatronics case is probably the best example of the change in the traditional notion of artisans having more practical than theoretical knowledge. This new qualification promises an individual that has a broader and higher level of knowledge and skills in comparison to traditionally trained artisans. This is causing contestation and perceived changes to the scope and level of artisanal work and thus also the demarcation of the work of technicians in this field of practice. As illustrated by the following narratives:

[C]ompanies are going to be forced to recognise these people at a higher level because of what they are going to be able to do – they are definitely not an artisan any

more ... that's why we changed our entry requirements and made it to a higher level just to make sure that we got people who ... are analytical thinkers. (HR Professional, MechCase)

[T]he artisan and technician will fall away as you'll have the mechatronics guy with automation knowledge and the practical training to do both those jobs ... the mechanical work and the electrical work that the artisan is doing and automation [of] what the technician is doing. (Artisan, MechCase)

[Y]ears ago an artisan was 20/80 – 20 per cent theory and 80 per cent practical – right now I do believe that in order to be successful in your field or in the automation field it needs to be like 50/50 and even 60 per cent theoretical. (Technician, MechCase)

While not a common perception across cases, some respondents in the electricians case raised the issue of the trend towards contract work and how this has affected the nature of demand for artisanal knowledge and skills, with some respondents arguing that this is deskilling artisans:

[B]asically artisans are no longer responsible so much for new installations ... and that is sad, because that is where you actually learn ... all of those things, your projects, etc. gets outsourced to contracting companies. (HR Professional, ElecCase)

[I]t would appear that skills are being diluted and lost in this process [of sub-contracting functions like installation]. (Artisan, ElecCase)

Reviewing data across the three cases suggests both real and perceived change to the knowledge and skills expected to be held by artisans. There is evidence of a greater scope of skills as well as changes to the level of knowledge and skills traditionally expected of artisans. This supports Maclean and Wilson (2009) in assertions that there will be changes to the required mix between skills

and knowledge for artisanal work, claiming that there would be a shift from a mix of 50 per cent theory and 50 per cent practical to one that is 80 per cent theory and 20 per cent practical, summarising that:

Technical Vocational Education and Training (TVET) is currently faced with the challenges posed by the displacement of the traditionally strong focus upon manual work in favour of mental work, or at least the changing mixture of competencies required in the workplace. (Maclean & Wilson 2009: xcvi)

The findings in relation to tools and materials build on these insights.

2.2 Tools have changed with implications for the manual dimension of artisanal work

The increased computerisation and automation of production processes has not only affected required artisanal knowledge and skills, but other elements associated with artisanal work as well. As alluded to by this respondent:

[T]he traditional view of an artisan ... is just hands, he provides you with hands to execute [but] that is also changing in the workplace. (Engineer, MillCase)

There are two implications for the materials and tools used for artisanal work.

First, technology tends to distance the artisan from the material he/she works with as artisans become less involved in direct production. Instead of going to the actual location of a problem, the PLC enables the remote identification and, often, repair of a fault. This respondent asserts:

[W]e've got a lot more of electronics on the system than before so while in the past you know you needed to mechanically or use your strength ... these days you can do it remotely. (HR professional, ElecCase)

Because technologies impact on the tools used to perform work, they also affect the manual component traditionally viewed as paramount to describing artisanal work, as this respondent indicates:

[N]owadays, a lot of companies, they are no longer using this manual stuff – they are going to PLC and drive. (Artisan, MillCase)

Other respondents confirm:

In the old stage you just started say, a pump, by hand ... you had to call somebody out to start another pump, or switch it off ... But now it's automated, you have a PLC, a computer system and it reads the demand, and as the demand grows another pumps [start] automatically ... It's automation. (Artisan, ElecCase)

[O]ne guy just comes and presses one button and they do their blasting and [then] it's done. No more having to stand there lighting dynamites and stuff. Now the winders are using PLC systems which relays the message. (Apprentice, ElecCase)

While it is acceded that technology alters the relation between the materials and tools used for artisanal work, respondents argue that the diagnostic and fault-finding skills so critical to describing the work of an artisan remain the same. This was strongly illustrated in the electricians' case. The 'material' that electricians work with is electricity, and this has not changed. While technology has automated and provided different tools for problem-solving, it is argued that the material and logic that underpin decision-making remain the same. As indicated by this respondent:

[T]here's been technology that came through ... it brought a bit of new dimensions, but ... a lot of stuff still remains the same, there's going to be only modifications here and there but it doesn't change the basics of the trade itself. (Engineer, ElecCase)

This view is supported by another respondent in the same case, when asked about the impact that technological changes have had in the electrical field:

Not in the mining industry, no. We're still there to make sure that the machines are operating. Whether it's new technology or old technology, I don't think that really has changed, the essence of what we need to do and how. (Engineer, ElecCase)

Another respondent agrees that the logic remains the same although the tools to do the job might change:

[I]f the electrician knows the basic principles of an electrician, the principle remain[s] the same, but the technology advances ... the equipment changes. (HR Professional, ElecCase)

However, it is clear that new technologies have the potential to shift the traditional relation between the artisan, materials and tools, and this has implications for the constructed and delineated scope of artisanal work in relation to other occupational groups. In review of the narratives, PLCs are recognised as potential expanders of the work of artisans, and affected occupational groups are trying to maintain their occupational domains. For example, these respondents assert that:

[T]he millwright normally they want to learn more, [but] for job security the [technicians] do not allow them ... on the PLCs, we put passwords on them, they do not inform them of changes we make in the systems [or] give them training in what has been changed. (Engineer, MillCase)

[A]s soon as there is a PLC fault or a drive fault ... then you phone the technician ... they will come and fix it ... I will ask them to explain it to me ... they explain it as difficult as they can. (Artisan, MillCase)

[Y]ou need to understand the PLC to know what's the [problem with the drive] part [of the] system so if you block him there he cannot even learn that. That is the main boundary that you can say ... the PLC will control the drive so they won't give the guys access to the PLC so the guys can't understand how the drive is working ... so, because of the drive ... if that's the fault the millwrights still needs to change it but he can't ... because he doesn't have the knowledge of the PLC and the drive.
(Engineer, MillCase)

Technicians try to maintain this boundary discursively in claiming PLC work to be outside of the normal maintenance functions associated with artisanal work, for example:

[M]y core job here ... is I assist the robot programmers and the robots ... I don't sit and maintain the robots on a daily basis. I do the initial installation – complete turnkey which is the integration between the robot, the PLC, the SCADA system ... I plan and manage ... I do all the costing, the planning, the purchasing ... I have to give daily feedback on that but I've had people doing all the work – the actual installation.
(Technician, MechCase)

[T]he PLC hardware and software remains the job of the technician ... the electrician generally would not do anything on the software side, purely because he needs a laptop ... and it's just not [in] their toolbag ... and I don't think they got the knowledge... it's not in their training. Obviously on the software side, you need to know what you doing, because you, at the end of the day you [are] controlling how a piece of machinery will react and if you make changes to the wrong part of that machine, you could end up injuring somebody or damaging the machine. (Technician, MillCase)

Mechatronics apprentices contest the claims of technicians in their field, constructing their work to be above the level of the traditional artisans; here,

PLC work and distancing from maintenance work appears key in such claims:

[T]he artisan ... he will be a hands-on person ... he will go in with his spanner, screwdrivers. He will physically work with the machine. On my side, I will plug in my laptop, do a diagnostics – where is the problem? What needs to be replaced ... I also make slight programme changes on PLCs, modify present operations, HMIs (human machine interface systems), setting your drives ...
(Apprentice, MechCase)

The symbolic importance of PLC work for successfully contesting the occupational boundary has clearly been recognised, as illustrated in the narrative of another mechatronics apprentice:

[A] guy that can sort out this PLC problem it's almost like he's performing magic, because people can't see what he's doing. But with a fitter you can see the guy is grinding.
(Apprentice, MechCase)

This highlights an interesting dimension of technology and tools and how these are used to contest the elements belonging to a particular occupational domain. It reminds us of Gieryn's (1999) assertion that the content of occupational jurisdiction is not naturally assigned. Rather, recognising an object (in this case, PLC work) to belong within an occupational scope of practice is the product of a successful process of claiming and defending an occupational boundary.

A final insight in this regard, is that while the manual dimension of artisanal work is shifting, manual abilities continue strongly to construct the occupational identity, although less so in the mechatronics case, as illustrated by the following artisans:

[A]rtisans [are] actually people who are more hands on and if you are lazy ... with your hands then I don't see a reason why you have to be an artisan. But if you're a more hands-on kind of person then ... it's a way for you. (ElecCase)

[G]ood artisans are required first of all, to be a competent artisan ... in addition to that ... plant knowledge ... well equipped ... as in tools ... very important for him ... good artisans: they are dedicated and committed to the job. (MillCase)

I'd say practical is the most important aspect of an artisan [one] must have the practical knowledge to do his job the way he's supposed to do, if he does not have the practical knowledge then the theoretical aspect of it does not count. (ElecCase)

The artisan is the one that's working with the tools ... he's more hands-on. The technical guy is more on the computer side. He [is on] the more advanced side of the advice and knowledge. Because basically I think your artisan is just giving the basics. (MillCase)

[T]he one [the engineer] sits with all the concept knowledge and the other [the artisan] sits with all the practical know-how. (MechCase)

From such data, it appears that the incorporation of increasingly computerised, mechanised and automated production processes has shifted the relation between the tools and materials of artisanal work, distancing the artisan especially from the manual dimension of work. This is in line with Gamble's (2015) assertion that 'advances in technology and materials have broken down many of the original trade demarcations'. An additional insight deriving from analysis of changes to the materials and tools for artisanal work is that such change has the potential to alter the delineated scope of artisanal work in relation to other occupational groups.

2.3 Organisation of work reinforces traditional occupational boundaries

In addition to changes to the division of labour that might result from technological change, the tendency towards greater integration and team-oriented settings is argued to describe the future workplace. Individuals are increasingly required to

work across disciplinary boundaries, as well as those who are considered to be skilled across disciplines (Friman 2010). This discourse of working as part of a team, and viewing teamwork as an essential feature of work, was found to be present across all cases and in this regard many respondents placed a lot of emphasis on the importance of communication skills and working together.

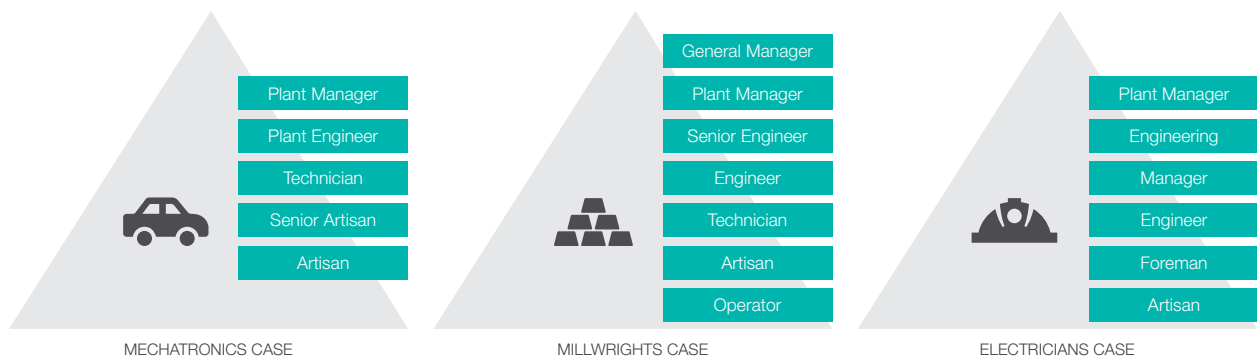
Your artisan is the hands-on guy. He will have a screwdriver, hammer and spanner and go do his job. From the technical side, we will first analyse it and see if there is not something else that can cause the problem. Where I see the engineer, they basically go through manuals; they go to the drawing board and sketch out everything ... The advantage of all three being able to work together, you have got the best of all three. (Technician, MillCase)

[W]e've got engineers who never worked with tools, who need our experience and we, as artisans we also need engineers who [know] things deeper than we do. It is important for engineers and artisans to work together. (Artisan, ElecCase)

I think it is quite important ... because if you work in a team like that you actually have a ... lot of people, artisans, millwrights, superintendents with a lot of knowledge and experience on their side. So basically working as a team you get to a better solution faster if I can put it like that and that is quite beneficial for the company. (Engineer, MillCase)

However, while the literature suggests flatter organisational structures (Heerwagen et al. 2010), and the discourse prevalent in the narratives of respondents suggests that working across occupational boundaries is required in present work contexts, this trend did not bear out in the organisation of work across cases. In all three cases, work continues to be organised hierarchically and the scope of artisanal work in relation to other occupational groups is clearly set out and reinforced (see Figure 4). Thus, while artisanal work is

Figure 4: Occupational hierarchies across cases as illustration of accepted occupational boundaries



perceived to have expanded in many ways, and elevated in some, occupational boundaries remain important for work organisation.

We found that the hierarchical organisation of work continues to play a prominent role in maintaining and defining the level of artisanal work, determining who performs which tasks and who is responsible for which functions. Work is organised around clearly determined tasks, as shown by this respondent:

[T]he system technicians ... are the guys looking after the PLC. And then below them are the instrumentation technicians ... looking at lower levels ... the valves and temperature control ... Below them we get the millwrights. And then below the millwrights you actually get the fitters and the rest of them. (Engineer, MillCase)

[T]he artisan is working with the grease ... artisans are physically on the floor doing nuts and bolts. The artisan is the guy who is on the floor as they call, kindly referred to as, 'on the tools'. The professional is doing the calculations and the draft, the project work. The technician is analysing trends [and] programming PLCs. (HR Professional, MillCase)

This organisation of work is reinforced in various ways, as indicated by this respondent:

[W]e've got second-year engineers and we're doing a competition for them ... to let them understand their role clarifications. You have to design a circuit for some purpose and you'll give it to the engineer and he will go and sit and do that design then he will give that to the technician who will go and build that circuit now and he will give it to the artisan to go and put it into the machine. (HR Professional, MillCase)

Organograms, work schedules and breakdown protocols reinforce the occupational domains. Breakdowns function as key sites of boundary contestation bringing up jurisdictional claims, where it is commonplace for artisans, technicians or engineers to indicate that 'this is not my work' – as illustrated by this response: 'I'm a technician, I'm not going to take that motor out because that's a job for an artisan' (Technician, MechCase). Strict escalation protocols also reaffirm the hierarchy, as shown in this quote:

[W]ith breakdowns the millwright is the first on site. If he can't sort an electrical problem out, he escalates it to a technician after one hour. If the technician can't sort it out he escalates it to a technologist after one hour. (Technician, MillCase)

The electrical case had less stringent time scales, but the organisation of work is similar:

[T]hat's [fault finding] an artisan's job and a foreman's job ... if it comes to a stage where

it does get tricky ... the engineer in electrical for instance will come and say what's going on? Can I help, have you checked it?

(Artisan, ElecCase)

While in theory artisans may get the opportunity from time to time to be innovative and use their initiative, looming above them is the fact that they may get into trouble for performing a task outside of their scope of practice. This no doubt serves as a deterrent from trying to transgress occupational boundaries in such a context. As indicated:

[I]f the plant is not busy, some of the guys they got that opportunity just to use [their initiative] but mostly, if they didn't get an instruction from their superiors, there is also some danger on that because if he gets [into trouble] while he is doing the job, which is not assigned, then it's a problem. (Artisan, MillCase)

It is not surprising to find that the way work is organised will reinforce occupational tasks and job descriptions; however, it is surprising that perceived elevation and expansion of knowledge and skills required for artisanal work exists alongside a more traditional and hierarchical division of labour. This illustrates how occupational boundaries can still be successfully contested amidst real change to work, as is illustrated by the narrative of this apprentice:

[M]aths and science help you in a way you do calculations but it's not an everyday thing, it's not like [an] engineer ... but they teach you a way of thinking ... help you into resolving solutions ... so you don't apply them but you apply them indirectly. (Apprentice, ElecCase)

In other words, while occupational scopes of knowledge and practice might be expanding or elevating, occupations can still be successful in maintaining their position in relation to other occupations. Old discourses, replaying the mental/manual status divide and reaffirming occupational jurisdiction still appear to be evident. The success of professional groups in connecting their labour practices with an abstract system of knowledge is clear as this respondent asserts that, for artisans,

maths and science knowledge '[is] not an everyday thing' – 'it's not like engineers'. The discourse about theoretical and practical knowledge reinforces the demarcations between professional, technical and artisanal work. This was strongly illustrated by the following narratives from the millwrights case:

[T]he engineer has got the theoretical knowledge, he's got the tools to think critically and evaluate the practical value of what he's doing [and his knowledge is] much broader yes [than that of the artisan]. (Artisan, MillCase)

[I]t's a matter of one saying, hey remember I'm better than you, I've got a certain level of education that helps me make decisions and the other guy is saying, hey, I'm the one who is doing this job, I know what is really involved here in the actual job. You never did the job, you just calculated the risk! (Technician, MillCase)

[T]echnicians are more theoretical, where artisans are more practical. For instance if I'm an artisan and I'm thinking of fixing something, if I think of it now and how would it work for us now, they want you to prove it, to talk about it ... you have to put it now theoretically while you are thinking practically. (Artisan, MillCase)

[B]ecause they know that they are from universities and we [are] from colleges, they tend to now feel that in terms of knowledge they a bit above us ... [also] when it comes to the job title, artisans have to ask the technician. They're above in terms of their job title ... so it puts them in a superior position to us ... [based on] the presumption of the knowledge they have over the other. (Artisan, MillCase)

Through this summary of evidence, we aimed to show the basis of claims to change in the key elements of artisanal work, as well as insights about the relationship between changes to work and demand for skills. This informs the overarching implications drawn out in the concluding section.

3. IT IS IMPORTANT TO UNDERSTAND CHANGES TO THE NATURE OF WORK

The evidence can be summarised in three substantive findings on artisanal work and occupational domain change. First, there is evidence for the expansion of the skills and knowledge required for artisanal work. Artisans are required to have greater administrative and managerial skills, which have not traditionally been viewed as part of the scope of practice. Artisanal work has also elevated in terms of the knowledge and skills required as artisans must incorporate and understand technologies and automation for them to be successful in the workplace.

Secondly, the requirement for increasing technology usage in daily work activities serves to distance the artisan from the material with which they work in the labour process. This also impacts on the manual dimension of artisanal work, such a central component of the notion and identity of artisans. While it is acknowledged that the manual dimension of artisanal work has surely been affected by work change, it is argued that the logic and central principles of artisanal work have not changed.

Finally, in terms of the organisation of work, we did not find much change. There is a strong discourse around teamwork and how central working across occupational boundaries is to success in the future workplace, but work is still organised hierarchically between occupations. The discourse about inferiority of practical to theoretical knowledge is still strong in the workplace and it serves to reinforce the division between professional, technical and artisanal work.

The study findings contribute in two key ways. First, they provide insight into a topic studied extensively

in the literature on professions and work, but from a vantage point of an occupational group that has seldom been the focus of such an investigation. The findings also contribute to the South African literature on artisans that tends to focus on the quantitative identification of the demand for artisanal skills, rather than trying to understand the nature of that demand and how it changes (Wildschut et al. 2012). An additional point to consider is that the three cases are all engineering-related, and this would have played a large role in findings. Further studies on artisanal work and occupation change would thus benefit from adding more diverse fields of practice.

However, while work change will continue to generate academic debate, changes to work and occupational jurisdiction are not only of academic interest, but are becoming a pertinent issue requiring engagement from policy-makers. If governments are trying to ensure adequate provisioning of skills for the development and growth of their economies and to address inequalities, it is critical to reflect on how we should plan for artisanal skills in shifting occupational contexts. The report contributes to this reflection by illustrating how work change can affect occupational scopes of knowledge and practice in diverging ways, with sometimes unanticipated outcomes for the real and perceived demand for related skills. This emphasises, again, the complexity of the relationship between demand and supply of skills, supporting contemporary shifts in academic and policy discourse away from manpower planning towards labour market signalling. This approach argues, rather, for regular analysis of credible data on the labour market and

the economy, alerting planners and decision-makers to labour market and economic change, which should enable them to make interpretations about the demand for different types of skills (DoL 2003). Bearing in mind that occupation, sector and geographic region are critical variables by which work change has traditionally been analysed (DoL 2003), a project such as this is a necessary step towards illustrating the value of more qualitative investigation into work change and the insights about demand and supply that can emerge.

The findings on change to occupational domains could be of relevance to skills planners in considerations of whether current occupational description represents an accurate reflection of the knowledge and skills requirements defined in relation to different occupational groups. This links well to ideas emerging from the Australian literature, which suggests that the idea of vocational streams⁵ (Yu et al. 2013) instead of occupations could be a useful approach to realising greater and more adaptive workforce capacity as a means of addressing skills mismatches, skills shortages and other forms of labour market failures. Essentially, the argument is for a more relational approach to understanding and responding to work change, suggesting that vocational streams can play a role in increasing the capacity of the workforce and in helping to address skills shortages.

Finally, the project findings highlight the importance of a sociological investigation into work and work change as important in understanding our labour market. It supports assertions by authors such as Gamble (2015) and Wildschut et al. (2015) that we need to focus more closely on understanding the complex and multilayered contextual issues that impact critically on the nature and location of skills demand and supply. The findings remind us that work is more than just a labour process and that there is a sociological dimension that impacts on the labour market. As Burger et al. (2015) note, 'it is vital to move beyond the surface and explore how class categories [in this instance, an occupational group] are perceived and used ... especially in light of its potential role in mediating key economic and political benefits'. This is in line with assertions of Vallas (2001), that there are 'social relations, normative codes and organisational structures that inform the behaviour, experience, and identities of people during the course of their working lives'.

It is clear that the sociological dimension of work is a critical component that directs behaviour and outcomes, but this is an often-undervalued approach to understanding the labour market. Studies such as this are important not only to illustrate this point, but to emphasise that understanding this dimension is a key precursor for any attempts to intervene in a labour market.

⁵ A set of linked occupations with related skills within a broad field of practice (Yu, Bretherton & Buchanan 2013).

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APPENDIX A: INTERVIEW SCHEDULES AND CONSENT FORMS

Guide questions for individual interviews: Artisan

Section A: Profile of respondent

Gender		Race				Age			Sector	Trade	Region	Size of company			
M	F	B	C	W	Other	18–29	30–45	46–65				XS	S	M	L

Section B: Introductory questions

1. Please provide a brief resume of your career. (Where do you come from? Where did you study? What kind of training did you complete – learnership/apprenticeship? How did you come to be in your present job?)

Section C: Occupational milieu and labour market

2. Since you have completed your training and given your experience in the labour market (note date and extent of experience), what do you consider to be the major changes to work in your occupation?
3. Would you say these changes have impacted on the following aspects in relation to the labour market requirements in your sector in terms of:
 - skills (e.g. problem-solving, language and literacy, mathematical)
 - knowledge (e.g. discipline-specific or not)
 - work organisation (e.g. teams, central or decentralised management)?
4. Do you feel that these changes are being taken up in artisanal education and training? How? For example, how would you rate the extent of alignment between the curriculum at the institution where you trained and the work you do now?

None	Some	Substantial
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Do you feel that the changes to your work/sector have had an impact on how your job is viewed or the contribution that you as an artisan can make?

Section D: Boundary objects and boundary work

5. What work do you do on a daily basis? Please discuss this with reference to the following:

- The range or types of tasks you perform.
- How these are organised (e.g. who do you receive tasks from, who signs off, etc.)
- Do you perform tasks in a standardised way or do you often have to use initiative?
- What kinds of things can go wrong in your particular job?
- Are fault-finding tasks usually carried out by you, or by a professional, or jointly?

6. Which tools do you use in carrying out your daily work tasks (computer programs, etc.)?

7. Which materials do you use in carrying out your daily work tasks (paper, metal, etc.)?

8. Which forms of knowledge are required in your job?

Please use the rating scale below to allocate a rating to each item.

Rating scale: 1 = All the time, 2= Sometimes, 3 = Never

Types of knowledge	Rating
Formal knowledge (scientific laws and principles learnt through study)	
Situated or practical knowledge (learnt through on-the-job experience)	
Knowledge of rules and procedures (as written up in company manuals)	
Other (specify)	
Discussion	

9. Which forms of skill are required in your job?

Please use the rating scale below to allocate a rating to each item.

Rating scale: 1 = All the time, 2= Sometimes, 3 = Never

Types of skills/competencies	Rating
Hand dexterity or manual skills	
Diagnostic and reasoning skills	
Planning, organising and time-management skills	
Other (specify)	
Discussion	

Section E: Boundary work

10. Do you work together with professionals in a team setting?

Not at all	Occasionally	Frequently
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Do you think it is necessary for the success of projects to work in teams with other professionals? Why do you say so?

- *Probes:* For which purposes is teamwork between professionals and artisans usually required? Is this more prevalent in certain trades or departments in your organisation?
- *Probes:* In these instances, what do you feel an artisan contributes? How does this differ from the contribution of a professional (i.e. types of knowledge, skills, competencies, abilities)?

11. Reflecting on these instances, would you rate these interactions as difficult?

All the time	Sometimes	Never
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Why is that so?

12. Do disputes or conflicts often arise in these teamwork situations?
- *Probes:* In which settings or situations do they usually arise?
 - *Probes:* Please give examples of conflicts that have arisen and that you have successfully resolved (try to establish whether syntactic, semantic or pragmatic approach is used).
 - *Probes:* Please give examples of where you were unable to resolve conflicts. Who would you typically call for assistance when conflicts arise?

Section F: Occupational Identity

13. What would you say are important attributes or skills an artisan should have? Is there anything specific to your trade that you think would be important?
14. How do these skills differ from the skills needed by a professional?
15. Do you have aspirations to further your training? Which steps (if any) have you taken to further your education/increase your skill set? Why do you/don't you feel it important to do this?
16. In closing, what would you say is the key difference between an artisan and a professional?

Guide questions for individual interviews: Human Resources Professional/ Supervisor

Section A: Profile of respondent

Gender		Race				Age			Sector	Region	Documents		Size of company			
M	F	B	C	W	Other	18-29	30-45	46-65			Organogram	Job descripts	XS	S	M	L

Section B: Introductory questions

- 17. Please provide a brief resume of your career. (Where do you come from? Where did you study? How did you come to be in your present job?)
- 18. What does your job entail? Which functions do you provide to employees?

Section C: Occupational milieu and labour market

- 19. Given your experience in the labour market and this organisation specifically (note date and extent of experience), what do you consider to be the major changes to work?
- 20. Would you say these changes have impacted on the skills and knowledge requirements in your sector:
 - In relation to (insert the specific types being interviewed at organisation) artisans?
 - In relation to (insert specific types being interviewed at organisation) professionals?
- 21. Judging from the artisans entering into your organisation, do you feel that the correct set of skills for work are being produced by the artisanal education and training system? How would you say that this compares to the training of professionals entering into your organisation?
- 22. Which opportunity structure and provisions for mobility exist in your organisation for artisans? And professionals?
- 23. Have there been changes in recent years in the organisation’s recruitment of new staff? For example, ‘categories/types’ of employees (qualifications, competencies and/or experience valued more)?

Section D: Boundary work

- 24. Can you provide me with your organisation’s organogram?
- 25. Would you be able to share a typical job description of an artisan and a professional in your organisation?
- 26. How would you define the difference between the daily work activities of an artisan in comparison to a professional?
- 27. Do artisans and professionals in your organisation work together in a team setting?

Not at all	Occasionally	Frequently
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Based on your experience at this organisation, would you say this is something that has changed over the last few years?

28. Do you think it is necessary for the success of projects for artisans and professionals to work in teams?
29. For which purposes is teamwork between professionals and artisans usually required? Is this more prevalent in certain trades or departments in your organisation?
30. What do you feel an artisan contributes in these situations? How does this differ from contribution of a professional (i.e. types of knowledge, skills, competencies, abilities)?

Section E: Boundary objects

31. Can you please describe the general work organisation of artisans and professions in your organisation? Please discuss this with reference to the following:
 - The range or types of tasks performed
 - Who they usually you receive tasks from, who signs off?
 - Are tasks performed in a standardised way or do they often have to use initiative?
 - Do they usually carry out fault-finding tasks on their own or jointly?

32. Which forms of knowledge are required in these occupations?
Please use the rating scale below to allocate a rating to each item.
Rating scale: 1 = All the time, 2 = Sometimes, 3 = Never

Types of knowledge	Prof.	Artisan
Formal knowledge (scientific laws and principles learnt through study)		
Situated or practical knowledge (learnt through on-the-job experience)		
Knowledge of rules and procedures (as written up in company manuals)		
Other (specify)		
Discussion		

33. Which forms of skill are required in these occupations?
Please use the rating scale below to allocate a rating to each item.

Rating scale: 1 = All the time, 2 = Sometimes, 3 = Never

Types of skills/competencies	Prof.	Artisan
Hand dexterity or manual skills		
Diagnostic and reasoning skills		
Planning, organising and time-management skills		
Other (specify)		
Discussion		

34. Reflecting on instances where artisans and professionals have to work together, would you rate these interactions as difficult?

All the time	Sometimes	Never
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Why is that so?

35. Do disputes or conflicts often arise in these teamwork situations?

- In which settings or situations do they usually arise?
- Please give examples of conflicts that have arisen and been successfully resolved. (Probe to establish whether syntactic, semantic or pragmatic approach.)
- Please give examples of conflicts that were not successfully resolved.

Section F: Occupational identity

36. What would you say are important attributes or skills that an artisan should have?

37. How do these differ from the skills needed by a professional?

38. Please comment on the status you feel is associated with an artisan. Does this differ from how you view a professional?

39. In closing, what would you say is the key difference between an artisan and a professional?

Guide questions for individual interviews: Professional

Section A: Profile of respondent

Gender		Race				Age			Sector	Occupation	Region	Size of company			
M	F	B	C	W	Other	18–29	30–45	46–65				XS	S	M	L

Section B: Introductory questions

40. Please provide a brief resume of your career. (Where do you come from? Where did you study? What kind of training did you complete? How did you come to be in your present job?)

Section C: Occupational milieu and labour market

41. Since you have completed your training and given your experience in the labour market (note date and extent of experience), what do you consider to be the major changes to work in your sector of employment?

42. Would you say these changes have impacted on the following aspects in relation to the labour market requirements for your occupation:

- skills (e.g. problem-solving, language and literacy, mathematical)
- knowledge (e.g. discipline-specific or not)
- materials used
- tools used
- work organisation (e.g. teams, central or decentralised management)

43. Do you feel that these changes are being taken up in training for your occupation? How? How would you rate the extent of alignment between the curriculum at the institution where you trained and the work you do now?

None	Some	Substantial
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Do you feel that the changes to your work/sector have had an impact on how your job is viewed or the contribution that you as a professional can make?

Section D: Boundary objects and boundary work

44. Which work do you do on a daily basis? Please discuss this with reference to the following:

- Please describe the range or types of tasks you perform.
- How are these organised (e.g. who do you receive tasks from, who signs off, etc.)
- Do you perform tasks in a standardised way or do you often have to use initiative?
- What kinds of things can go wrong in your particular job?
- Are fault-finding tasks usually carried out by yourself, or by an artisan, or jointly?

45. Which tools do you use in carrying out your daily work tasks (computer programs, etc.)?

46. Which materials do you use in carrying out your daily work tasks (paper, metal, etc.)?

47. Which forms of knowledge are required in your job?

Please use the rating scale below to allocate a rating to each item.

Rating scale: 1 = All the time, 2 = Sometimes, 3 = Never

Types of knowledge	Rating
Formal knowledge (scientific laws and principles learnt through study)	
Situated or practical knowledge (learnt through on-the-job experience)	
Knowledge of rules and procedures (as written up in company manuals)	
Other (specify)	
Discussion	

48. Which forms of skill are required in your job?

Please use the rating scale below to allocate a rating to each item.

Rating scale: 1 = All the time, 2 = Sometimes, 3 = Never

Types of skills/competencies	Rating
Hand dexterity or manual skills	
Diagnostic and reasoning skills	
Planning, organising and time-management skills	
Other (specify)	
Discussion	

49. Do you work together with artisans in a team setting?

Not at all	Occasionally	Frequently
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Do you think that, in the present day and age, it is necessary for the success of projects to work with artisans in teams?

50. For which purposes is teamwork between professionals and artisans usually required? Is this more prevalent in certain trades or departments in your organisation?

51. What do you feel an artisan contributes in these situations? How does this differ from contribution of a professional (i.e. types of knowledge, skills, competencies, abilities)?

52. Reflecting on these instances, would you rate these interactions as difficult?

All the time	Sometimes	Never
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Why is that so?

53. Do disputes or conflicts often arise in these teamwork situations?

- *Probes:* In which settings or situations do they usually arise?
- *Probes:* Please give examples of conflicts that have arisen and been successfully resolved (try to establish whether syntactic, semantic or pragmatic approach is used).
- *Probes:* Please give examples of conflicts you were unable to resolve. Who would you typically call for assistance when conflicts arise?

Section F: Occupational identity

54. What would you say are important attributes or skills that a professional should have? Is there anything specific to your occupation that you think would be important?
55. How do these differ from the skills needed by an artisan?
56. Do you have aspirations to further your training? Which steps (if any) have you taken to further your education/increase your skill set? Why do you/don't you feel it important to do this?
57. In closing, what would you say is the key difference between an artisan and a professional?

Information sheet and consent form

Individual interview: artisans/professionals and human resources (HR) professionals

Who we are and what we are doing

Hello, I am _____. I am working for the Education and Skills Development Programme (ESD) at the Human Sciences Research Council (HSRC). The HSRC is a national research organisation and we are conducting research commissioned by the Department of Higher Education and Training (DHET).

There has been a range of changes to the nature of work that requires us to investigate the nature of work more systematically. It can be argued that artisanal occupations have been particularly affected by these changes in terms of the pace, nature and location of production in a globalised market. In sum, the field has had to respond to changes in demand over time for skills and technologies used in workplaces, the globalisation of production, the increasing utilisation of information and communication technologies (ICTs) and related matters. These changes hold implications for the nature of artisanal and professional skills by shifting the boundaries between different forms of knowledge, skills, competencies and so, too, associated identities.

This raises various questions and requires an investigation that will touch on issues of status and social identity in relation to the profession and occupation, and is also relevant to considerations of how changes in work are experienced by individuals of different classes, genders and ages, for instance, within the South African context.

Your participation

To contribute to this overarching research purpose, we are asking you to participate in a *case study interview*. We are interested in finding out your views and want you to reflect on your personal experience as an artisan in relation to the changes to the nature of your work. How do you think this has/might have impacted on your current notions of identity and in relation to expert occupations in South Africa? If you agree to participate, the interview will last about 30–60 minutes. **Participation in this research is voluntary.** Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, we would really appreciate it if you do share your thoughts with us. If you choose not to take part in answering these questions, you will not be affected in any way. You may stop me at any time and tell me that you don't want to go on with the interview.

Confidentiality

We are also asking you to give us permission to tape-record the interview. We tape-record interviews so that we can accurately record what is said. The audio recordings and notes taken during the interview, as well as the transcriptions of the interviews, will not be made available to any persons other than the researcher/s concerned and the project leader. The information will be stored with the project during the duration of the research. When the research is completed the data will be stored in the ESD storeroom at the Cape Town office of the HSRC for five years in accordance with HSRC policy. Your answers will be stored electronically in a secure environment and used for research or academic purposes now or at a later date in ways that will not reveal who you are. All future use of the stored data will be subject to further Research Ethics Committee review and approval.

We will not record your name anywhere and no one will be able to connect you to the answers you give. Your answers will be linked to a fictitious code number or a pseudonym (another name) and we will refer to you in this way in the data, any publication, report or other research output.

Risks/discomforts and benefits

At the present time, we do not see any risk of harm from your participation. The risks associated with participation in this study are no greater than those encountered in daily life. There are no immediate benefits to you from participating in this study. However, this study will be helpful to us in that we hope will promote understanding of changes to occupational structures. If you would like to receive feedback on our study, we will record your phone number on a separate sheet of paper and can send you the results of the study when it is completed some time later.

Who to contact if you have been harmed or have any concerns

This research has been approved by the HSRC Research Ethics Committee (REC). If you have any complaints about ethical aspects of the research or feel that you have been harmed in any way by participating in this study, please call the HSRC's toll-free ethics hotline 0800 212 123 (when phoned from a landline from within South Africa) or contact the Human Sciences Research Council REC Administrator, on tel. 012 302 2012 or e-mail research.ethics@hsrc.ac.za.

If you have concerns or questions about the research, you may contact the project leader Dr Angelique Wildschut (021 466 7980/ awildschut@hsrc.ac.za).

Consent to case study interview

I hereby agree to participate in this research project. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues that may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that if at all possible, feedback will be given to respondents and stakeholders in the sector on the results of the completed research.

.....
Signature of participant

Date:

I hereby agree to the audio tape recording of my participation in the study.

.....
Signature of participant

Date:



LABOUR MARKET
INTELLIGENCE PARTNERSHIP

The Shifting Boundaries of Artisanal Work and Occupations

This report aims to give insight into the changing nature of artisanal work in relation to other occupational groups, using the concept of occupational boundaries as a lens. Has the work of artisans changed and, if so, how? The research draws from an empirical base established through three sector studies. It finds that, in order to better understand and respond to the challenges of contemporary labour markets, we need to focus more attention on investigating changes to the nature of work.

About the LMIP

The Labour Market Intelligence Partnership (LMIP) is a collaboration between the Department of Higher Education and Training, and a Human Sciences Research Council-led national research consortium. It aims to provide research to support the development of a credible institutional mechanism for skills planning in South Africa. For further information and resources on skills planning and the South African post-school sector and labour market, visit <http://www.lmip.org.za>.

WWW.LMIP.ORG.ZA