



SKILLS AND TRAINING IN ZIMBABWE'S MINING INDUSTRY
PRELIMINARY REPORT OF INDUSTRY SURVEY

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Skills and Training in Zimbabwe's Mining Industry:
Preliminary Report of Industry Survey

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Objective

The Institute of Mining Research undertook a research project to analyse the use, need and presence of skills in Zimbabwe's mining industry as well as current training activities and future training needs required by both industry and government in the search for higher production levels and greater productivity. A first step in this longer term project was to undertake a survey of mining companies involving the administration of a questionnaire in 1993. The questionnaire included a series of closed questions on production, levels of mechanisation, job categories and titles, real wages, bonus, nationality, diplomas and certificates, current training activities and needs. The following is a preliminary analysis of findings.

Responses have been aggregated to provide a quantitative picture of the industry's skill level based on the skill distribution and the presence of formally recognised academic and technical qualifications. The analysis of training will be limited to an inventory of current activities and future needs. Reference will be made to changes in both skills and training requirements resulting from moves towards greater mechanisation of some mines.

Rate of Response and Representativity

In July 1993, the survey questionnaire was sent out to all the country's operating mines whose names were obtained from the Ministry and the Chamber of Mines and from the monthly report of remitting mines of the National Employment Council for the Mining Industry (NEC).² A list was thus compiled of 93 operating mines and 12 head offices of large mining companies. This covered all the registered operating mines but left out the more difficult to account for sectors such as the cooperatives, some of the difficult to reach smallholders and the gold panners, sectors of Zimbabwe's mining industry that are traditionally difficult to document.³ Responses were returned between August and November.

The overall rate of response was good and can be said to be representative not only of the industry as a whole but of certain subsectors of the industry. Forty-five mines responded, for an overall response rate of 48%. Thirty-two were completed questionnaires and the remaining 13 reported their mine to be inactive at the time of the survey. Of the 32, 3 were from head offices reporting on their training activities and the remaining 29 were from operating mines. Twenty-four were underground mines, 4 of which also operated an open pit. Four mines operated only open pits.

Responses among subsectors of the industry varied. A first breakdown of subsectors is according to the type of ownership, with a first category of ownership made up of mines owned by large, often multinational, mining companies with head offices in Harare and a second by a single company or individual. Our

initial list included 49 mines in the first category, operated by the 12 large mining companies. Their response rate is good. Initial responses indicated that 9 mines were not operating, thereby reducing our sample to a possible total of 40 operating mines. Out of these, we received 27 completed questionnaires. Three of these were from head offices responding specifically to questions on training, leaving us with a total of 24 filled out questionnaires from operating mines owned by large companies, out of a possible 40, giving us a response rate of 60%. Of the 12 head offices, 10 responded either directly or through their individual mines, giving us a response rate of 83.3% of the country's largest producers.

A second form of ownership are the mines owned either by companies operating only one mine or by individuals. There were 44 mines in this category with a substantially lower rate of response. Only 10 responded, 5 of these indicated they were either closed or their quarrying activities were inappropriate for this study. Only 5 completed the questionnaire, giving us a rate of completed questionnaires of only 11% of the mines owned by small companies or individuals. This discrepancy in the rate of return can be explained by the lack of apparatus to compile and organise the data required by mines owned by the smaller companies. Mines with large head offices have more staff, especially in their personnel departments, as well as computerised records, making it easier for them to respond. In addition, many may have been closed at the time of the survey as small mines tend to open and close with greater ease in response to market or other conditions.

Mines are also broken down according to minerals produced as the response rate varied among the different sectors. Responses were received from all of the country's principal mining sectors, including gold, precious metals, nickel, copper, tin, coal, iron ore and chromite mines, there was a marked absence or weakness in responses from chromite and asbestos mines. The questionnaire was sent out during a major downturn in chromite prices, contributing to a lower rate of response among the category of mines owned by large companies as several small chromite mines are tied to large companies. There was also little response from the asbestos sector as it has also been affected by low international prices prompted by environmental concerns. The platinum group of minerals were not yet fully active so did not take part in the questionnaire. Not surprisingly the gold sector provided the strongest response, coinciding with a general air of optimism prompted by an upswing in market prices in the last half of 1993. Employees in gold from the 14 responding gold mines represent 41.6% of the total number of employees surveyed, almost identical to gold's 41.8% share of total employment in 1992.⁴

The questionnaire is representative of the industry's employment levels as well. The total number of employees included in the survey (21,897) represent approximately 44% of total mining employment, calculated in June 1992 at 49,300.⁵ Responses are also representative of shift-paid workers. The number of workers in the shift-paid categories 1 - 13 included in the responses, represent 50% of all shift-paid workers in the industry at the time of the survey.⁶

Skill Levels

The following section aggregates questionnaire responses in order to assess the level of skills present and used within the industry. It will do so by analysing skill distribution, formal skill recognition, education levels and entry requirements reported in the questionnaires.

Skill distribution:

To begin assessing overall skill levels requires an examination of the industry's skill distribution to determine the relative weight of each skill group. The questionnaire asked the mines to report the number of employees at each skill level. Companies reported the number of workers in each shift-paid skill category. These are job categories graded from 1 to 13 (NEC job categories) according to the skill level required for the job. These are unionised categories and the skills required for each has been defined, and are periodically reviewed, in the industry-wide collective agreement. The calculation of staff numbers was based on company reports listing the number of employees in each staff job title present at each mine. These are jobs graded at 14+ and their classification and skill content depend on individual agreements with employers.

Company reporting on staff composition indicates a more flexible practice around the classification into either staff or skilled job categories than indicated by the formal job categorisation described above. When asked to list staff job titles, companies included several titles such as shift boss and overseer miner, considered by the company as distinct from both

upper management and shift-paid employees, even though they formally continue to be graded in the shift-paid unionised skilled categories. Yet elsewhere in the questionnaire, when asked to list the number of employees in each job category, companies included them in the 1-13 shift-paid categories.⁷

To analyse these figures, we grouped the numbers reported in each skill category into broad skill levels, including unskilled (categories 1-3), semi-skilled (4-8) and skilled (9-13) to determine the relative weight of each category and of each skill subgroup. We found that unskilled are 44% of the total workforce surveyed, semi-skilled are slightly above that at 44.2%, skilled at just under 10% and management at 2%.

The following Table I lists this skill distribution alongside corresponding figures gathered since 1981. This will give us a picture of the changes in the relative weight of each subgroup since independence, allowing us to establish a context within which to analyse the current data.

Table I: Skill distribution between 1981-1993⁸
(Percentage of total employees surveyed)

| | 1981 % | 1984 % | 1986 % | 1991 % | 1993 % |
|------------------------------|-----------|-----------|-----------|-----------|-----------|
| Unskilled Category 1-3 | 59 | 58 | 49 | 44.4 | 44.0 |
| Semi-skilled Category 4-8 | 26 | 34 | 38 | 45.6 | 44.2 |
| Skilled Category 9-13 | 12 | 6 | 8 | 7.9 | 9.58 |
| Professional/ Managerial | 3 | 2 | 2 | 2 | 2 |

The steady decline in the percentage of workers categorised as unskilled between 1981 and 1993 (from 59 to 44%) and the growth of the semi-skilled (from 26 to 44.2%) and skilled (from 12 down to 6 in 1984, increasing to just under 10% by 1993) categories seen in this table demonstrate a consistent pattern since independence. The growth in the semi-skilled categories and the decline in the unskilled categories are particularly striking, providing an initial indication that there has been an increase in skill levels in the industry.⁹ These changes alongside the parallel growth of the skilled categories indicate an overall pattern of manpower development resulting from a greater division of labour and a growing complexity in the way mining is carried out, requiring additional skills.

The growth of the skilled category noted during this same period reflects a slightly different pattern given its initial decline immediately after independence. This is possibly linked to the departure of white skilled workers on the heels of

independence and their slow but consistent growth since indicates that they have likely been replaced. Their persistent increase, especially since 1990, indicate their growing importance to the workforce. In spite of these changes, the professional and managerial categories have remained unchanged after a small post-independence drop.

These figures give us an aggregate picture of the industry, yet a breakdown by size of mine reveals interesting tendencies, especially around skill distribution, as can be seen in the following Table II:

Table II: Skill breakdown according to the size of mine
(Percentage of all employees surveyed, 1993)

| | 6 Small mines % | 6 Large mines % | All % |
|--------------|--------------------|--------------------|----------|
| Unskilled | 58.4 | 41.4 | 44.0 |
| Semi-skilled | 33.9 | 44.8 | 44.2 |
| Skilled | 2.5 | 12.1 | 9.6 |
| Management | 5.0 | 1.55 | 2.0 |

This category of small mines is distinct from the categorisation of mines owned by smaller companies or by individuals, described above. Grouping them by size rather than by type of ownership reveals trends resulting exclusively from the size of the mine. The 6 small mines included herein are the 6 smallest mines surveyed in the study with less than 150 employees each; 4 are owned by individual owners and 2 by large companies. The large ones are the 6 largest with more than 1,000

employees each and all are owned by large mining companies.¹⁰ This comparison between the 6 small and 6 large mines indicates that the overall movement towards the use of higher skill levels noted above is more pronounced in the larger mines than in the smaller. The larger mines organise their production around the use of a higher percentage of intermediary level technicians and supervisors including geologists, metallurgists, surveyors, overseer mines, and others as noted in their list of job titles, so that skilled categories now represent 12.1% of total employment on the large mines surveyed. This corresponds to the general move in capital-intensive mining seen in some parts of the world, towards the hiring of a greater percentage of technicians and professionals as the industry moves towards the use of longer-term planning and bulk extraction techniques.

By contrast the 6 smallest mines reflect a skill breakdown comparable to the immediate post-independence figures with 58.4% of total employment in unskilled categories, compared to the 1981 figure of 59% for all mines. Their management component at 5% in 1993 is not only far higher than the large mines, but is higher even than the 3% of managers noted in 1981 for all mines. There is also a continued low level use of skilled categories, only 2.5% compared to 12.1% in the large mines, and even lower than the 12% found in all mines in 1981.

This comparison reflects a discrepancy between large and small mines that is well known within the industry, but is rarely documented, especially as regards differences in skill levels. Thus while the industry overall is moving towards a skill distribution in which the higher skilled workers have a

relatively greater weight, this is reserved exclusively for the large mines, with the country's numerous small mines continuing to rely almost exclusively on unskilled and semi-skilled workers. Their few skilled workers fall into management categories thereby explaining their relatively larger percentage in relation to the total workforce.

Yet when we look more closely at specific job categories in all mines, we see a continued use of the least skilled workers within each of the subdivision of skills and a continued reliance by all mines on unskilled workers. Companies recorded the highest numbers of shift paid workers in category 1: thus 24% (5,033) of those between categories 1-13 are in category 1. Category 1 is the lowest level of skills grouping general labourers in all departments, including the numerous lashers in the largest department, mining. Following closely behind is category 4 (the lowest grade of the semi-skilled categories 4-8) with 19% (3,905) of miners between categories 1-13. This is the entry-level into the semi-skilled categories, including designated tradesmen in the engineering department, the mining or drill operators in the mining department, the plant operators in the processing department and the first supervisory level in all departments, the gang leaders. Again this category is numerous because of the number of mining or drill operators in the mining department, operating mostly the jackhammer or hand-held drill. By a simple arithmetic we can see that 43% of shift paid workers are in categories 1 and 4, while 88.2%¹¹ of the total workforce continues to be in the skilled and semi-skilled categories.

There is some distinction in this area between large and small mines. Of the 6 largest mines, only 3 have category 1 as the most numerous, while in 5 out of 6 of the smallest mines, category one is the most numerous. Overall only 20.4% of workers are in category 1 in large mines, contrasting highly with 45.7% in small mines. In category 4, the pattern shows less discrepancy with the overall pattern: 15.7% of workers are in this category in large mines compared to 19% in small mines. Though these 6 small and 6 large mines are a small sample, we do note that the reliance on category 1 is still pronounced in both the largest and the smallest mines, in keeping with the aggregate figure for all mines, yet attenuated in the case of the largest, and more pronounced in the smallest.

We note therefore that the increase in semi-skilled and even skilled categories of workers in relation to the unskilled categories indicates an overall increase in skill levels since this data has been compiled at the time of independence. Yet the continued importance of the least skilled workers overall, with 44% of the total workforce, and especially the preponderance of the least skilled in the unskilled and semi-skilled job categories (categories 1 and 4) overshadows such a conclusion. We are prompted to conclude instead that the overall skill levels continue to be low with a continued reliance on labour intensive techniques of production such as lashing and low technology drilling as demonstrated by the high number of workers in those activities. This pattern is more pronounced in the small mines where their figures indicate little change since independence. The larger mines by contrast are beginning to move away from this

model as they hire more workers in the skilled categories as they increase their level of mechanisation and move towards more differentiated and complex mining techniques, as demonstrated by the hiring of geologists, surveyors, technicians, tradesmen and others. We will return to this when we look at those mines reporting to be moving towards some form of technological change.

Formal skill recognition:

An additional assessment of the skill levels in the industry is obtained by examining the level of formal education and formally recognised skills. The survey included questions on the number of degrees and certificates held by employees at each mine. Questions included employees final level of education, ranging from doctorate to junior certificates, and including the increasingly important technicians' degrees; the level of certification attained by designated tradesmen (Skilled Worker Classes 1 to 4) and the number of people with blasting licences and certificates of competency in the wide variety of mining skills: overseer mining, plant operation, surveying, the mining diploma and the mine manager's certificate of competency, all awarded after gaining experience and government testing. Other questions inquired about minimum educational requirements for entry into each category of employment.

The following Table III indicates the numbers of degrees and certificates reported:

Table III: Degrees and certificates (Reported in 1993 survey)

| | Total Numbers Reported | % of total workers surveyed | % of mines surveyed without degree |
|------------------------|------------------------------|--------------------------------------|---|
| Doctorate | 5 | 0.02 | 82.0 |
| Masters | 80 | 0.30 | 72.4 |
| Bachelor | 168 | 0.76 | 34.4 |
| Technicians | 202 | 0.92 | 37.9 |
| A levels | 97 | 0.44 | 58.6 |
| O levels | 1,028 | 4.69 | 37.9 |
| Junior Certificate | 616 | 2.80 | 37.9 |
| Skilled Worker Class 1 | 444 | 2.02 | 24.1 |
| Skilled Worker Class 2 | 432 | 1.97 | 24.1 |
| Skilled Worker Class 3 | 654 | 2.98 | 20.6 |
| Skilled Worker Class 4 | 1,405 | 6.41 | 34.4 |
| Mine Blasting Licence | 1,864 | 8.50 | 10.3 |
| Full Blasting Licence | 248 | 1.10 | 3.4 |
| Acetylene Torch Cert. | 48 | 0.21 | 58.6 |
| Overseer Miner | 126 | 0.57 | 27.5 |
| Senior Overseer Miner | 15 | 0.06 | 44.8 |
| Plant Operator | 108 | 0.49 | 41.3 |
| Mine Surveyor | 28 | 0.12 | 37.9 |
| Gov. Mining Diploma | 38 | 0.17 | 34.4 |
| Mine Manager's Cert. | 19 | 0.08 | 41.3 |

Not surprisingly, there were a low number of academic degrees reported. Of the 21,897 employees included in the survey, there were 5 doctorates¹² and 80 masters, a higher number than expected. There were however only 168 bachelors' and 202 technicians' degrees, a relatively low number given the importance of mining engineers to the industry and the growing importance of technicians. Bachelor levels degrees were present at a high number of mines - 82.7% of responding mines, but only 58.6% of mines had graduates of technical schools in their employ. At 13 mines (44.8%), the bachelor's degree was the

highest final degree present while 12 had either a masters or doctoral degree as the highest. Several mines had significantly less: 3 mines had the mine manager's certificate of competency as the highest while one mine showed a complete absence of degrees and certificates, having only one person with a mining blasting licence.

The absence of technicians may be explained in part by operating problems at the Bulawayo School of Mines, long deplored by the industry. A recent project to correct these problems has been jointly undertaken by government and industry. Only 4 mines noted a shortage in the degree and diploma areas, and these were in the engineering and geology fields (4 mining and 1 mechanical engineer and 1 resident geologist).

Also low were the number of A and O levels and junior certificates. Again a large number of mines reported a total absence of these diplomas at their mines: 58.6% reported a complete absence of A levels and 37.9% of mines did not have either O levels or junior certificates.

The level of mining certificates was also low with the exception of the commonly held blasting licence or the full blasting licence with 2,112 workers having one or the other, representing 9.6% of the workforce surveyed. Given its centrality to production, this is to be expected and only one mine reported having neither. By contrast, the other certificates are relatively rare. There are only 19 people (0.08% of the workforce) with mine managers certificates of competency, working on 12 of the 29 operating mines surveyed (41.37%). The other lowest is the senior overseer miners

certificate with only 15 certificates (0.06%), working in only 10 of the mines (34.4%). With the exception of the blasting licences, all mining certificates were present in less than 1% of the workforce surveyed.

Given the industry's emphasis on experience, the absence of mining certificates is difficult to understand. These certificates are obtained through a combination of experience gained at the workplace followed by a process of verification through government testing. These certificates are essential to move up the hierarchy of job categories, requiring them as low as category 5 upward (mine blasting licence) and especially beyond category 11 (requiring the Certificate of Registration as overseer miner). Several of the certificates are required by law for several management positions. In addition, the level of experience in the workforce is high with 39% of workers surveyed having 10 years of experience or more and only 21.6% have less than 2 years experience. In spite of their importance and workers' many years of experience, the certificates are difficult to obtain by anyone outside the industry as the training and testing is only undertaken at the request of mining companies for their current employees. Anyone not currently employed at a mine cannot obtain these certificates, thereby limiting access and thereby the pool of people holding these certificates. At the time of the survey, companies reported 34 people on 13 mines currently registered to obtain certificates: 22 as overseer miners (including both overseer and senior overseer miner), 6 in surveying, 5 plant operators, 1 trainee rock mechanic engineer. All were from large mines.

As in other areas, we note distinctions in degree and certificate levels between large and small mines as indicated in the following Table IV:

Table IV: Workers at each degree level on large and small mines
(Percentage of total working in large or in small mines)

| | 6 Large mines % | 6 Small mines % |
|-----------------------|--------------------|--------------------|
| Doctorate | 0.04 | nil |
| Masters | unavailable | nil |
| Bachelors | unavailable | 0.44 |
| Technicians | 0.66 | 1.10 |
| A levels | 0.71 | 0.74 |
| O levels | 2.87 | 10.40 |
| Junior certificate | 0.95 | 13.10 |
| Skilled Workers 1-4 | 22.40 | 1.50 |
| Mine Blasting Licence | 7.10 | 8.00 |
| Full Blasting Licence | 17.80 | 2.20 |
| Acetylene Torch Cert. | 0.60 | 0.44 |
| Overseer Miner | 0.50 | 0.60 |
| Senior Overseer Miner | 0.03 | 0.60 |
| Plant Operator | 0.23 | 0.14 |
| Mine Surveyor | 0.06 | 0.30 |
| Gov. Mining Diploma | 0.12 | 0.14 |
| Mine Manager's Cert. | 0.06 | 0.30 |

The most significant difference between large and small mines is in the area of designated trades which are better represented in the large mines (22.4% of total mine workers on large mines) and almost absent on the small mines (1.5% of the total on small mines). There is also a discrepancy in blasting licences with 24.9% of workers on large mines with blasting licences and only 10.2% on small mines. Interestingly, the small mines have a larger number of mine blasting licences while the large mines have a larger number of the more highly skilled full blasting licences.

Advanced degrees including all the doctorates and masters are on the large mines with none in the small mines. Surprisingly however, the small mines have a higher rate of mine certificates than the large mines, with the exception of the blasting licences. Thus there is a higher percentage of overseer and senior overseer miners, of surveyors, mining diplomas and mine management certificates on the small mines, but there are less plant operators, undoubtedly because less small mines have processing plants as part of their operations.

This higher percentage on the small mines is not necessarily inconsistent with the data noting that they also have a lower level of skills is the consequence of government regulations requiring a minimum number of people with certain certificates at the mine site. The absolute number of people present is in fact small, making the per capita ratio of the few people with certificates seem relatively larger. This also explains the higher management figures found in small mines as the overall labour intensity of production and low level of skills puts people with these skills automatically into management categories. This also contributes to the absence of intermediate skilled categories in the small mines. Interestingly however, the small mines prefer people with mining licences and certificates rather than people with university or college degrees, or even technicians' degrees. This seems consistent with their emphasis on experience rather than formal education expressed elsewhere.

Current minimum education requirements for entry into all sectors of the industry are relatively low. Of the 17 mines answering this question, 47% (8 mines) require no minimum for

unskilled job categories, and none for 30% (5) of mines in the semi-skilled categories. The minimum required in the unskilled categories was basic literacy (1 mine) and grade 7 (3 mines). Requirements for semi-skilled categories included junior certificates at 3 mines, 1 grade 7, 2 O levels and 2 NEC certificates. At the other end of the scale, 10 mines required professional degrees at the upper management level and 2 required only A levels. In between, middle management most often required diplomas (at 6 mines) and A levels (at 4 mines); with a propensity of O levels and NEC certificates at the lower management and skilled categories. In general, there was little mention of technicians' degrees as only 2 mines required this degree, using them in their middle or lower management levels. The concern with minimal entry requirements seems to be a concern for the large mines primarily as few small ones responded to this question (only 2 of the 6 in our small mine category). When they did, the emphasis was not only on education, but education combined with experience.

In conclusion therefore, in spite of the larger numbers of doctorates and masters than expected, the industry demonstrated an overall low level of formally recognised skills and minimal education requirements at entry-level, strengthening the previous findings regarding the low skill levels present in the industry. Thus not only is there a preponderance of workers in the lowest skill categories as seen above, but there are few workers with formal education and formally recognised skills. This is aggravated by the low number of employees with technicians and mining certificates, an important indicator of the low level of

formally recognised skills given that their practical nature and their importance in moving up from one skill category to another. The small mines demonstrate a relatively greater use of mine certificates as opposed to formal degrees, yet they employ few people holding these certificates and are not currently involved in the registration of new ones.

Training

Activities and needs:

Most companies surveyed accord a great deal of importance to training. Sixty-two percent of the mines have a staff development programme, 72% do some form of training at the mine and 62% are involved in training activities outside the mine. Mines linked to large companies do the bulk of their training through their head office, many of which run extensive training programmes and departments, with additional training support channelled through bursary programmes. Sixty-two percent of mines (18), either directly or through their head office, provide scholarships but these are reserved for the upgrading of their own employees. Two head office companies have a scholarship programme aimed at students outside their employ, both of these support students studying only mining subjects.

Again the small mines are distinct, reporting few training activities. With the exception of two of the 6 small mines linked to large mining companies who do training through their head offices, the remaining small mines, those owned by individuals or independent companies, do no in-house or even external training whatsoever. Thus these training comments are

exclusively from the mines owned by large companies.

The most important training area is safety with 65.5% of all mines doing safety training on site. This is followed by 48.2% of mines doing equipment training. A total of 58.5% of mines are involved in some form of management training, including business and especially supervisory skills. Management training is undertaken with more variety than either safety or equipment training as only 20% of the mines note doing it on site, while 37% use outside facilities, either exclusively or in addition to their on site training.

Companies were asked to indicate which skill levels were targeted for training. In a descending order of importance, training priority was most frequently assigned to lower management, followed by upper and middle management ranks, followed by skilled, semi-skilled and unskilled workers.

In addition to already existing training programmes, mines noted further training needs. Fifty-eight point six percent of mines (17) stated they needed further training facilities, again with the noted exception of the independent small mines. The areas needed were in further management training including supervisory skills as well as planning, accounting and personnel. Equally important were both practical and academic training in the technical areas including technicians' skills, engineering, geology and surveying. Several also noted the need for training in rock mechanics and rock control. A third area of priority was the need for further safety training. A majority of mines noted a preference for in house rather than external training.

Training and Technological Change:

Mines were asked to list their levels of mechanisation and equipment used, if they were undergoing changes in their technology and mining methods and if these would bring about changes in their skill requirements and training needs. Distinctions in this area are not between the size of mines but by type of ownership.

While 75% of mines responded that they are mechanised, the equipment used confirms the low level of technology present in the industry and its general labour intensity. Most equipment is smaller-scale, track equipment as 50% (12) of underground mines continue to muck with labour intensive scrapers, 78% use the medium size locos ranging between 1 and 3 tonnes, or less than 1 tonne. Only 21% (5) of underground mines have trackless load-haul dumpers. Drilling equipment again was smaller. There were no jumbo drills reported in use, 79% used the jack leg drill alongside hand-held drills present in 75% of the underground mines. Fifty-eight point three underground mines reported using the longhole drill as well.

Of all mines surveyed, half (14) noted some form of technological improvement or change in mining methods currently being undertaken or planned for the near future. Forty-four point eight percent of mines (13) were undergoing some form of technological change. These changes were evenly divided between a new mine, a new area of the mine and an existing area of the mine, involving for the most part the introduction of scooptrams (replacing lashers in 3 mines) and longhole drills (2 cases), other drills (3 cases). In others, investment was being

undertaken in a wide variety of equipment to improve production in all aspects - crushing, hoisting, and processing, yet much of the reported investment (\$98.7 million in 1992 and \$36.3 million in 1993) remained in the area of new mine installations or replacement of existing equipment. On the other hand, only 6 mines were introducing changes in their mining methods either in a new mine or in a new area of the mine, revealing only limited reorganisation of production.

Only 13.7% of the mines surveyed (4) noted that they required new types of skills to accompany these changes, yet 40% of mines (11) noted that they required additional skill levels, so that a total of 44.8% of mines (13) surveyed were undergoing some change in skill requirements. There is a relatively good correlation (40%) between mines moving to new technology or some form of mechanisation and those seeking new and/or greater skills among their employees. This correlation was higher (42%) among mines owned by large companies and lower (20%) among small independent mining companies.

In a small number of mines (24% or 7 mines), the search for new or more skills contributed directly to the need for greater training and to changes in the entry-level education requirements. Again this was almost exclusively at mines owned by large companies (6 of these 7) where even apprentices were now required to have a higher level of scholarship upon entry (4 out of 7). The mines owned by small independent companies put greater emphasis instead on experience, requiring hands on experience as well as scholarship upon entry. Several mines noted that the job market, at the time of the survey, was relatively

open, making it easier for them to hire people with additional, and what they considered were more adequate skill levels.

Several mines (20% or 6 mines) noted that they had or were in the process of introducing multiskilling by combining jobs. This is an increasingly common phenomenon in mining as companies search for greater flexibility in the assignment of workers to a wider variety of jobs, especially in the skilled job categories, or when particular skills are hard to find. Again most of these, with the exception of one, were by mines owned by large companies.

These changes in technology, mining methods and skill levels were being introduced in order to improve productivity or increase the volume of output in 44.8% of the mines (13 mines). Other considerations mentioned were the improvement in safety records, the reduction of downtime and costs, and the adjustment to deteriorating ground conditions.

In conclusion therefore, while the level of skills is low throughout the industry, there is evidence that there is a trend beginning to emerge towards the acquisition of new skills and an increase in skill levels. An important majority of mines noted requiring new training facilities and some mines noted that the search for higher and more skills is caused by the move towards some technological innovation and changing mining methods. Interestingly, 20% of responding mines are following trends seen elsewhere towards multiskilling in the search for greater flexibility of its workforce, especially its skilled workforce.

Conclusion

From this brief analysis of survey findings, we are able to confirm several aspects of skills and training that many in the industry suspected but were only partially documented.

It is widely believed the industry is labour intensive, using a relatively low level of skills but is moving towards a skill distribution using a higher skill mix. Our survey found that while there is a definite trend towards an overall increase in the use of skilled categories at the expense of less skilled categories, it also indicated that unskilled and semi-skilled categories of workers continue to make up 88.2% of total employment. The lowest levels of skills within these sub-categories (categories 1 and 4) continue to be the most numerous, using the simplest techniques - lashing and hand held or jack leg drilling. Technological change is only in its early stages with the introduction of load-haul dumpers replacing lashing in some cases and long hole drills used in larger mining areas. This new technology has been introduced in a somewhat piecemeal way, integrated into the current organisation of production, rather than as part of a major investment in mine reorganisation.

In general respondents indicated a high level of training activity especially in the area of safety, equipment use, and management skills and a great demand for further training. In spite of the low levels of skills however, this was aimed especially at management skills among management categories as well as technical skills and further safety training.

While a majority of companies require additional training opportunities, there was a 40% correlation between the search for

skills and technological change, indicating a trend towards the use of new types of skills, a higher level of skills, new training opportunities and higher entry-level requirements. With one exception, this trend was true for mines owned by large companies who we saw use somewhat more intermediary skill levels such as technicians, skilled tradesmen and others. This reflects a somewhat more complex organisation of production, greater job differentiation and the more specialised skills that these require, that is tentatively emerging on some of the large mines.

In the small mines, especially those owned by small companies or individuals, the trend is different. The small mines use older technology and lower levels of skills, reflecting a skill distribution similar to that found immediately after independence. They show less interest in increasing skill levels and gaining access to additional training activities. The small mines put a greater emphasis on experience rather than formal skill recognition as entry-level requirements rarely request degrees and there are less employees with degrees and certificates. At the same time, they use less skilled tradesmen. It is reasonable to assume that this trend is more pronounced in the informal sector of artisanal mining where technology and job differentiation are generally simpler.

Surprisingly, in spite of the long years of experience among the mining workforce and the importance of practical skills to the industry, there were relatively few people with mining certificates, with the exception of blasting licences. This was even more puzzling given the need to have these certificates in order to move up the different skill categories. This was true

for both large and small mines.

We have thus been able to confirm many of the suspicions surrounding current conditions in skills and training in the mining industry. The great variety in size, technology and organisation of production present in the industry resulted in the identification of a variety of conclusions and trends rather than in broad overriding conclusions. The next step is to integrate these into a broader analysis of the way skills are actually used and recognised at the workplace to determine where gaps or bottlenecks might occur. This broader analysis and a look at how these trends work in practice will allow us to make some conclusions regarding improvements that will hopefully lead to recommendations regarding improvements in the recognition and optimum use of skills and training.

Notes

1. The author is Research Associate with the Centre for Developing Area Studies (CDAS), McGill University, Canada and undertook this research in collaboration with the Institute of Mining Research, University of Zimbabwe and the support of the CDAS and CUSO, a Canadian non-governmental organisation.
2. Thanks are extended to the Ministry and Chamber of Mines for their assistance in compiling the list of active mines and to the Chamber of Mines for sending out the questionnaire.
3. Among these are the many rock quarries. We will be able to say little about quarrying activities as the few responses received stated that they operate sporadically, mainly upon demand, and use simple equipment and a low level of skills that have little in common with underground mining, requiring skills that resemble those of equipment operators, found in construction. These problems in integrating them into the survey are partially due to their recent categorisation as mines, being only recently included under the Mining Act. These quarries continue to remain distinct from the mines in their methods of operation and organisation, including in their use and requirements of skills and training.
4. Government of Zimbabwe, Central Statistical Office, June 1992.
5. Government of Zimbabwe, Central Statistical Office, Quarterly Digest of Statistics, March 1993, giving figures for June 1992. Mining employment is estimated to have declined by July 1993, allowing us to conclude that the number of workers surveyed represent slightly higher than 44% of the total workforce. In addition, the poorer represented sector in this survey, the informal sector, is also generally poorly represented in government and other statistics, including employment statistics. It is commonly estimated by the industry that there are close to 10,000 employees in this sector who remain unaccounted for in government employment figures. Thus their poorer representativity in our survey is a reality of the industry itself.
6. This is based on total employment of mines reporting to the National Employment Council for the Mining Industry (NEC) in the month of August 1993. By law, all mines with 40 shift paid employees (i.e. in categories 1-13) or more are required to participate in the NEC, and only two of the 29 questionnaires returned were from non-NEC members.
7. This is indicative not only of a certain flexibility around the more skilled job categories, but of the ongoing debate between management and labour over the proper role of the skilled job categories that regularly emerges during national-level negotiations. Management has been arguing that the skilled categories, especially category 13, should be considered a management position because of its supervisory capacity. The union argues that this supervisory capacity is not unique among shift-paid employees given the supervisory responsibilities found

in several shift-paid categories. In fact, the first category including any such responsibilities is found as low as category 4 with the gang leaders.

This company attitude could be a reflection of the previous Paterson grading system in which skill levels were grouped into A, B, C and D grade bands. The C band were considered staff and correspond to the 9-13 NEC job categories. This impression was reenforced by the surveys of 4 mines, grouped into one head office reporting on the continued use of the Paterson grading scheme for internal purposes.

8. This breakdown has in fact been chosen because it corresponds to the organisation of data collected by the Government's Manpower Survey since 1981, allowing us to compare our findings with their surveys in a longer time series. However, while this is useful in an aggregate sense, a note of caution is necessary as the series illustrated in Table I includes data compiled from 3 different sources.

Figures for 1981, 1984, 1986 are from Government of Zimbabwe, Ministry of Manpower Development, Manpower Surveys, various years. 1991 figures are from the Chamber of Mines, Mine Workers Survey, December 1991. This data was aggregated by the author from the Chamber of Mines Report which gave the number of employees in each job category from 1-13, according to the same breakdown found in the Government Manpower Surveys. 1993 data was from our survey.

9. There are strong indications that this trend began before independence with the emergence and growth of the semi-skilled category of workers during the 1970s

10. This categorisation of mines is distinct from the breakdown provided above between mines owned by large companies (which includes some small mines with less than 150 employees) and those owned by small independent companies or individuals (4 of the 5 responding mines in this category have less than 150 employees, while one has just over 300). This categorisation of mines based only on size and not on type of ownership allows us to make conclusions based purely on the size of the mine. We will see below that certain issues, especially around training, while showing some variety between large and small mines, are greatly affected by the type of ownership as well as by size.

11. This figure is taken from Table I where it is indicated that 44% are in the unskilled 1-3 categories, 44.2% are in the semi-skilled 4-8 categories.

12. A few of these were reported to be medical doctors.



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