1996 CENSUS DATA QUALITY: OCCUPATION

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SUMMARY OF FINDINGS

The 1996 Occupation Paper evaluates the data quality of the occupation questions in the Census. The topics analysed in the paper include: the changes made to the occupation questions between the 1991 and 1996 Censuses, non-response rates, levels of undefined coding and coding discrepancies, as well as a comparison with the Monthly Labour Force Survey.

The main conclusions of the analyses are as follows:

- The non-response rate decreased from 5.5 per cent in 1991 to 1.7 per cent in 1996.

- The major groups 'Managers and Administrators' and 'Intermediate Production and Transport Workers' recorded the highest percentages of undefined coding.

- Coding discrepancies analysis at the major group level suggests that coders had difficulties differenciating between 'Managers and Administrators', 'Professionals', 'Associate Professionals' and 'Intermediate Clerical, Sales and Service Workers'.

- Further coding discrepancies analyses demonstrate that the most significant misallocations occurred when occupations within the major group 'Managers and Administrators' were confused for occupations within the major group 'Intermediate Clerical, Sales and Service Workers' or vice versa.

- The data reconciliation between the 1996 Census and August 1996 Labour Force Survey indicated that even though the differences in counts/estimates for both collections were statistically significant, the proportional comparisons for occupation major groups by age and by States showed an overall similarity in the distribution of data.

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1. INTRODUCTION

Occupation data have been collected in every Australian census in relation to all employed persons. Data on occupation are used for analysing current and potential imbalances in the labour market. This information is then used to develop policies and programs in education, training, immigration, industry and industrial relations.

The objective of this paper is to provide an evaluation of the quality of occupation data collected in the 1996 Census.

This paper contains information about question design for occupation data in the 1996 Census and previous censuses, and how the design and sequencing of questions can affect the quality of responses. The paper describes procedures used to code data to the Australian Standard Classification of Occupations (ASCO), Second Edition, and provides a description of the Quality Management System applied to occupation data. The paper also includes an analysis of the level of undefined (dump) coding allocated during the 1996 Census and a comparison with undefined coding allocated during the 1991 Census. Further analyses examine the coding discrepancies recorded by the Quality Management System in 1996 and the non-response rates in 1986, 1991 and 1996 Censuses for occupation data. The paper also compares 1996 Census occupation data to the August 1996 Labour Force Survey occupation data.

1.1 Background

Prior to 1986, a single question was asked on title of occupation. In 1986 a second question on the main tasks or duties that a person usually performed in his or her job was included to improve the quality of coding. The questions remained the same between 1986 and 1991 but the examples used were revised and an instruction 'For public servants, state official designation as well as occupation' was added.

For the first time in 1986 responses were coded using the Australian Standard Classification of Occupations (ASCO) and Computer Assisted Coding (CAC) was introduced for occupation data.

In 1991 the coding system was conceptually the same but integrated into a comprehensive CAC system which was used for all census questions.

For the 1996 Census the coding system remained the same but occupation data were coded using a revised version of the ASCO. A detailed description of ASCO First and Second Editions and their comparability can be found in Appendix 1.

1.2 Quality Issues in occupation data

The Census is 'self-enumerated' which means that the census form is completed by the respondent with minimal assistance from the census collector. Thus the way questions are presented in the census forms, the sequencing, the instructions and the examples used to help respondents answer the questions contribute to a large extent to the response rate and to the codeability of occupations.

Processing issues can also affect data quality. The main processing issues examined in this paper are:

- training of coders;
- procedures and systems;
- quality and accuracy of indexes; and
- perception of coders.

1.3 List of Acronyms used in this Paper

ASCO - Australian Standard Classification of Occupations

CAC - Computer Assisted Coding

NFD - Not Further Defined

QR - Query Resolution

QM - Quality Management

MIS - Management Information System

CD - Collection District

QIT - Quality Improvement Team

AC - Automatic Coding

ICR - Intelligent Character Recognition

2. COLLECTION ISSUES

2.1 Sources of Errors

2.1.1 Form Design

Accurate and complete responses to census questions depend strongly on form design. The major aspects to consider when trying to improve form design are:

- clear sequencing of questions;
- clear and concise instructions; and
- relevant examples in the questions.

The current question structure was devised for the 1986 Census in conjunction with Computer Assisted Coding (CAC). Some changes were later implemented to increase the level of responses. As an example the instruction introduced for Question 34 in the 1991 Census form : 'For public servants, state official designation as well as occupation' greatly improved the amount of detail given by respondents to the question and therefore improved the detailed level of coding.

Another change to the 1991 forms was not so successful and resulted in a dramatic increase to the level of non-response to occupation data compared to other personal variables. This was the effect of sequencing instructions at the beginning of the series of questions relating to labour force status. If a respondent ignored the sequencing instruction in Q30 'Now go to 32', mistakenly gave an answer to Q31 'Did the person actively look for work at any time in the last 4 weeks' and obeyed the sequencing instruction for that question 'Now go to 40' the person would not answer any further questions relating to occupation or industry. (Refer to Appendix 2 for the sequencing of labour force questions in the 1991 Census.) To prevent these errors the order of the questions relating to labour force status was changed for the 1996 Census and the 'Looking for Work' and 'Hours Worked' questions were moved to the end of the employment related questions. In a further attempt to reduce confusion the sequencing instructions were made more obvious with the use of arrows to indicate the next question to be answered if some had to be skipped. If there was no arrow, the following question had to be answered. These changes were successful and resulted in a drop in the non-response rate (refer to section 2.2).

Evaluation of the 1991 data led to changes to the examples used in the 1996 Census for Q34 on 'Occupation Title' and Q35 on 'Main Tasks', and the inclusion of an instruction to managers to state which main activities they controlled. Examples for straightforward occupations and activities such as 'Accounts Clerk' 'recording accounts', 'Civil Engineering Draftsman' 'preparing drawings for dam construction', and 'Floor Tiler' 'fixing cork tiles' were replaced with:

- 'Maths Teacher' ' teaching secondary school students' to prevent teachers answering 'teaching' as their main activity;
- 'Apprentice Toolmaker' 'learning to make and repair tools and dies' to comply with a request from the then Department of Employment, Education and Training to target apprentices.

The instruction for managers was included in test forms before the 1996 Census to determine whether it improved the coding of managerial task information by obtaining more detail about the activities of the people the managers supervised. ASCO classifies managers by the activities of the people they supervise e.g. 'Sales and Marketing Manager' or 'Data Processing Manager', and the aim of the new instruction was to decrease the numbers of respondents providing answers such as 'managing' or 'running a business' which made the coding to ASCO difficult. Eventually the instruction in the 1996 Census form asked managers to state 'main activities managed' instead of 'controlled' with a view to get more detailed answers for better coding. Appendix 3 provides the 1996 Census questions relating to employment.

During processing there were concerns about the final 1996 Census form design because Q32 about 'Occupation Title' and Q33 about 'Tasks Performed' were on a different page to employer name and industry, requiring coders to flip between pages if coding data using both occupation and industry information. This might lead to loss of information as coders had greater difficulty in identifying the correct data they should select. A different placement of the 'Income' question, which would have enabled the labour questions to be on the same page, was tested but the results showed that it would reduce the quality of responses to the 'Income' question.

2.1.2 Respondents

Australian censuses are self-enumerated which means that respondents fill in the forms themselves. Various reasons may prevent them from answering the questions relating to occupation data either completely or accurately. They may:

- provide insufficient or imprecise information;
- not answer because of their reluctance to disclose details of their occupation;
- not answer because of the perceived difficulty of the questions;
- miss sequencing of questions and therefore skip relevant questions;
- write multiple answers; or
- mis-identify their occupation.

Other factors may increase the level of non-response such as 'haphazard' responding and the general tendency to omit write-in answers probably considered too much effort to formulate. These issues are reflected in the amount of non-response to the questions and in the number of 'Not Further Defined' (NFD) codes assigned by the process.

2.2 Non-response Analysis

Not everybody had to answer Questions 32 and 33 about occupation data. These questions were only applicable to persons who were fifteen years or over, and were employed. If this was the case and if Question 32 or Question 33 was left unanswered, a code for 'Not Stated' was assigned.

The low non-response rate for the 1986 Census occupation data (1.1 per cent) was probably due to processing procedures. The determination of labour force status was performed clerically and the tendency was to classify people as 'Not in the Labour Force' rather than leaving the response as 'Not Stated'. The non-response rate increased to 5.5 per cent in 1991 probably due to form design including the change in sequencing for the labour force questions, as was explained in section 2.1.1. Another factor may have

been the automation of the occupation data processing procedures. The 1996 Census non-response rate dropped to 1.7 per cent after improvements to the form design. This rate was the lowest recorded for the 'write-in' questions in the 1996 Census. As an example the highest non-response rate was recorded for the question relating to the highest level of qualification obtained (10.86 per cent).

2.3 Not Further Defined Coding

2.3.1 Description

The principles of coding to ASCO required responses given in the census forms to be coded to the most detailed level of the classification possible. If the response was not detailed enough to allow coding to the 6-digit level, a 'NFD' (not further defined) code was allocated. The coding was structured as follows:

- the occupation level (for example 3491-11) called the 6-digit level; or
- the 'NFD' (not further defined) category of the unit group to which it belonged (3491-00) called the 4-digit level; or
- the 'NFD' category of the minor group to which it belongs (3490-00) called the 3-digit level; or
- the 'NFD' category of the sub-major group to which it belongs (3400-00) called the 2-digit level; or
- the 'NFD' category of the major group to which it belongs (ie 3000-00) called the 1-digit level; or
- the inadequately described category.

The unit group (4-digit level) and the occupation level (6-digit level) in each major group have been consolidated to the 4-digit level, and therefore the 4-digit level is not considered a NFD code for the purpose of this analysis. For example ASCO code 3491-11 'Ambulance Officer' and ASCO code 3491-13 'Intensive Care Ambulance Paramedic' have been combined into ASCO code 3491 'Ambulance Officers and Paramedics'.

When a code other than the occupation level is allocated, this is referred to as dump coding. Major reasons why dump coding occurs are:

- the level of information provided in the census forms is not detailed enough. As discussed in section 2.1.2, for various reasons respondents might miss questions relevant to them or not answer them adequately;
- multiple responses in the forms cause the system to code to a higher code so that fine level information is lost. For example a manager describing his or her tasks as managing building construction (ASCO code 1191) and managing engineering (ASCO code 1221-11) would be allocated the NFD code for the major group 'Managers and Administrators'; and
- coders may not follow correct procedures or may not use all the information in the forms. For example when coders had to flip over the page in order to use the industry information they had greater difficulty in identifying the correct data or remembering it.

2.3.2 Analysis of 1996 Not Further Defined Coding

The following table shows the distribution of NFD or dump coding which occurred during the 1996 Census processing.

Table 1 : Distribution of Not Further Defined Responses in 1996 Census

ASCO, Second Edition major groups	*% of responses coded to major group (1-digit code)*	*% of responses coded to sub-major group (2-digit code)*	*% of responses coded to minor group (3-digit code)*	*% of responses coded to unit group (4-digit code)*	*Total persons*
Managers and Administrators	10.9	1.2	6.1	81.8	709,925
Professionals	1.5	0.3	4.0	94.2	1,309,468
Associate Professionals	0.7	1.0	2.1	96.3	861,169
Tradespersons and Related Workers	1.5	0.1	0.5	97.9	997,010
Advanced Clerical and Service Workers	0.1	0.0	0.0	99.9	329,844
Intermediate Clerical, Sales and Service Workers	0.4	0.3	0.5	98.8	1,222,735
Intermediate Production and Transport Workers	2.3	10.9	3.4	83.4	661,425
Elementary Clerical, Sales and Service Workers	0.4	0.5	0.4	98.8	677,395
Labourers and Related Workers	7.2	0.3	1.6	90.9	667,250
Not Stated					128,595
Inadequately Described					71,503
Total					**7,636,319**

The table shows that within the major group 'Managers and Administrators' only 81.8 per cent of responses were coded to the 4-digit level, the lowest percentage in the table. There was a 10.9 per cent dump coding to the 1-digit level, which demonstrates that the question redesign that aimed to get more specific responses for managers (Question 33: 'For managers, state main activities managed.') had not been successful (see section 2.3.3). The high proportion of responses coded to the 3-digit level (6.1 per cent) was mostly attributable to the ASCO minor group ‘1310 Farmers and Farm Managers nfd’ (5.8 per cent of the major group). This was probably due to persons answering 'Farmer' to Question 32 but not specifying in Question 33 the type of farming they carried out, or not providing appropriate information to the industry questions which could have helped coders to further define the type of farming.

Two other major groups stood out with fewer responses coded to the unit group level: ‘Intermediate Production and Transport Workers’ (83.4 per cent), and ‘Labourers and Related Workers’ (90.9 per cent).

Within the major group 'Intermediate Production and Transport Workers' 10.9 per cent of responses were coded to the 2-digit level. This was probably due to machine operators not specifying the type of products they were working on: 64,360 responses

were coded to the ASCO sub-major group 7200 'Intermediate Machine Operators nfd' (9.7 per cent of responses in the major group). This group had proven to be a problem in past censuses. For that reason examples including this type of occupation had been used in census forms and changes to the examples had been made in 1996 in an attempt to improve the quality of responses. In 1991 Census Q34 mentioned 'Extruding Machine Operator' and Q35 gave 'operating plastic extruding machine' as an illustration of main tasks performed. In the 1996 Census the example was changed to 'Tanning Machine Operator' and 'operating leather tanning machine'.

The major group ' Labourers and Related Workers' was subjected to the second highest percentage of dump coding to the 1-digit level (7.2 per cent of responses). This seems to indicate that persons falling into this group supplied hardly any information about their occupation. It has already been mentioned in section 2.1.2 that questions requiring write-in answers are not always answered well.

2.3.3 Comparison between NFD data in 1991 and 1996 Censuses

This analysis examines the dump coding which occurred in 1991 as a comparison of data quality between both censuses. The 1991 data were coded using the first edition of ASCO. This first edition comprised four levels and did not use 3-digit codes. The unit (4-digit) group and the occupation (6-digit) levels have again been merged together for the purpose of this analysis.

Table 2 : Distribution of Not Further Defined Responses in 1991 Census

ASCO, First Edition major groups	*% of responses coded to major group (1-digit code)*	*% of responses coded to minor group (2-digit code)*	*% of responses coded to unit group (4-digit code)*	*Total persons*
Managers and Administrators	12.3	1.0	86.7	858,541
Professionals	2.0	7.4	90.6	883,936
Para-professionals	2.7	3.8	93.6	479,446
Tradespersons	1.5	0.7	97.9	958,497
Clerks	14.8	0.3	84.9	1,066,915
Salespersons and Personal Service Workers	2.1	0.4	97.5	981,931
Plant and Machine Operators, and Drivers	2.6	17.6	79.8	500,798
Labourers and Related Workers	7.1	0.3	92.5	879,405
Not Stated				390,671
Inadequately Described				86,035
Total				**7,086,175**

Within the major group 'Plant and Machine Operators, and Drivers' only 79.8 per cent of responses were coded to the unit group level . This was mainly due to the dump coding to the minor group level which at 17.6 per cent was the largest in the table. ASCO, First Edition minor group 7400 ' Machine Operators nfd' greatly contributed to this figure with a count of 61,279 (12.2 per cent). As was seen before in Table 1 the dump coding to the equivalent ASCO, Second Edition sub-major group 7200 'Intermediate Machine Operators nfd' had a similar effect during 1996 Census processing.

The major group with the second lowest level of responses coded to the unit group was 'Clerks' with 84.9 per cent. When people had been stating general clerical tasks in Q33 or giving no task information those responses were coded to (1-digit) code 5000 ‘Clerks nfd’. The problem was resolved in 1996 with the creation of an occupation 6111 ‘General Clerks’ in the second edition of ASCO.

The ASCO major group with the third highest level of dump coding was 'Managers and Administrators'. Only 86.7 per cent of responses were coded to the unit group level. The large dump coding at the major group level (12.3 per cent) demonstrates that responses to Q35 in the 1991 Census form about main tasks performed (see Appendix 2) were not informative enough and that the addition of an example specifically designed to target managers was a major priority (see Q33 in Appendix 3). Unfortunately this attempt did not have much impact and dump coding persisted to a similar level in 1996.

Within the major group 'Professionals' two minor groups largely contributed to the 7.4 per cent dump coding to the 2-digit level: 39,641 responses (4.5 per cent) were coded to ASCO code 2400 ‘School Teachers nfd’ and 21,557 responses (2.4 per cent) were coded to ASCO code 2200 ‘Building Professionals and Engineers nfd’.

In many instances school teachers were not coded to a more detailed classification though, if coders had followed correct procedures and used industry information where required, the system would have allocated 4-digit codes. In order to provide an additional check a new edit was introduced in the system in 1996:

> If occupation is school teacher nfd then
> where industry is pre-school education set occupation to pre-school teacher
> where industry is primary education set occupation to primary teacher
> where industry is secondary education set occupation to secondary teacher

The edit was successful with only 18,112 responses (1.4 per cent) coded to ASCO, Second Edition minor group 2410 ‘School Teachers nfd’.

‘Building Professionals and Engineers nfd’ translated into new ASCO code 2120 ‘Building and Engineering Professionals nfd’. The level of dump coding which occurred in 1996 dropped to 1.9 per cent, a figure low enough not to be of concern.

The major group 'Labourers and Related Workers' was subjected to the third largest dump coding to the first digit level with 7.1 per cent of responses. As seen in Table 1 this occurred again in 1996 (7.2 per cent). This could be because respondents had difficulties describing their activities and the system could not match the information at a more detailed level using the ASCO index.

Overall there was a lower rate of NFD coding in 1996. The improvements were due to:

- better form design;
- the restructuring of ASCO; and
- the coding rules which allowed greater use of industry responses.

3. PROCESSING ISSUES

3.1 Description of Coding Procedures

In 1986 Computer Assisted Coding (CAC) was introduced for coding occupation responses. The coder was required to identify ‘basic’ and ‘qualifying’ words from the response given in the census form. The first three letters of the 'basic' and 'qualifying' words were entered. Matches from the words displayed on the computer screen were selected based on colour matching rules. All words in yellow had to match exactly the words in the respondent' s occupation title. To select an entry containing words displayed in green or blue, a close match was required with the task response. To select an entry containing words displayed in white, a close match with the task response, the employer response or the industry response was required.

An example of the sequence followed by coders for the system to allocate a code to the response, using 1996 CAC follows:

- Title (Q32): *Salesperson*
- Main tasks (Q33): *Selling door to door*
- Employer's business name (Q34): left blank
- Type of industry (Q36): *Door to door canvassing, specialising in encyclopedias*

The coder would type: *sal*
A list of words would appear on the screen in yellow ('must match exactly' code).
The coder would select: *salesperson*
Another list would appear:
- advertising (in white for: 'must match closely with title, task, industry or employer')
- amway (in white)
- direct sales (in white)
- door to door (in green for: 'must match closely with title or task information')
- internal sales (in green)
- manufacturing industry (in white)

and so on.

The coder would select ‘door to door’ and the code returned would be ASCO code 8293-15 ‘door to door Salesperson’.

Many occupations were not easy to code and the coder would have to go through many selection screens before a code could be allocated. Even so, the allocation might end up with a ‘NFD’ code to a 1-digit level in spite of the coder' s efforts, depending on the type of information provided. See Appendix 4 for a summary of the coding procedures used for training coders in 1996.

In many cases, the coding system would require coders to supply further information from the forms before a final match could be made. When the message 'Raise a query for this response' was displayed, it meant that a matching index entry could not be found by the system for the occupation title, and this was referred to an expert group of coders with access to a wide range of coding resources for resolution.

In 1986 there were some concerns about the CAC process in use. The code was displayed on the screen and written by the coder onto the census form. Coders became familiar with the codes and in some cases they anticipated the codes without properly matching the responses against the index. Coders were allowed considerable scope in allocating codes and the evidence suggests that they were making every attempt to code occupation to the lowest possible level of the classification using all available information in the census form outside that permitted by strict application of ASCO procedures. This may explain the low level of coding to not further defined codes.

In 1991 the coding system was conceptually the same but integrated into a comprehensive CAC system. The major difference was that the ASCO code was applied directly to the computer file and was not seen by the coders. There was no possibility of coding from memory or of making decisions on the codes to allocate to occupation data.

The CAC system was used unchanged for 1996 processing.

3.2 Detection of Discrepancies

A quality management (QM) system was established to identify systematic discrepancies in processing, provide feedback to coders on discrepancies, and produce and analyse discrepancy rates by topics (see Appendix 5).

During the processing of the 1996 Census data, a sample of each coder's work on Collection Districts (the smallest census unit for collection, processing and output of data) was selected for reprocessing by another coder and any mismatches were looked at by an adjudicator who would decide on the correct code. If the adjudicator disagreed with the initial coder, a discrepancy would be recorded. There were 7,636,319 applicable census counts from which 519,772 occupation responses (6.8 per cent) were recoded by QM coders. Altogether 55,720 discrepancies (10.7 per cent) were recorded in the Management Information System (MIS) reports.

The quality management system in place during processing allowed the detection of discrepancies and the calculation of a crude discrepancy rate. This crude discrepancy rate differs from a true discrepancy rate for the following reasons:

- a higher proportion of ‘poor’ coders’ work was included in the quality monitoring sample;
- the quality management check coders could make the same mistake as the original coder and therefore an error would not be detected;
- there is not always an absolutely correct code for every response; and
- discrepancies were recorded for any difference in coding between the quality management coder and the original coder. Some discrepancies were far more serious than others. For example coding an electrical engineer (code 2125-11) to an electronics engineer (code 2125-13) was given the same weight as coding a tradesperson (major group 4) to a professional (major group 2).

Figure 1 : Crude Discrepancy Rate for Occupation Data during 1996 Processing

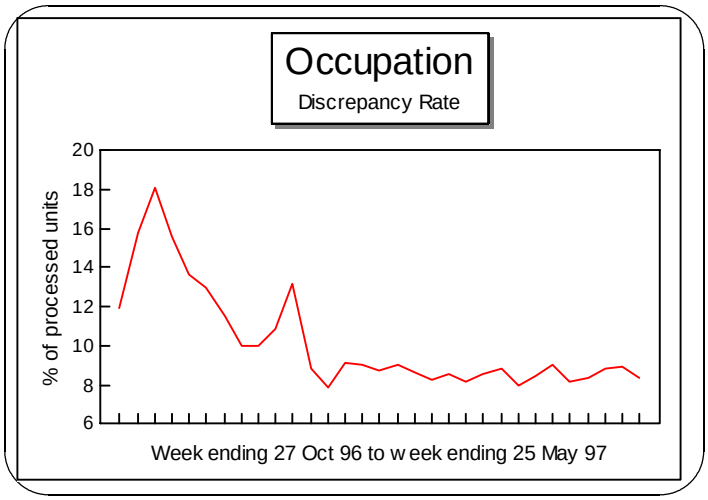


Figure 1 shows the trend of the crude discrepancy rate recorded during processing for occupation data. The crude discrepancy rate actually decreased from 22 per cent in November 1996 when coders were still unsure of the process to 10 per cent during the last weeks of the processing which ended in August 1997. The second peak in January 1997 corresponds to an intake of new coders. The average of 11 per cent was slightly higher than the original acceptable rate but the decrease from 22 per cent indicates a remarkable improvement in coders' understanding of concepts and coding procedures.

3.3 Discrepancy Analyses

3.3.1 General Information

As discussed in Appendix 5 when a coder and a QM coder reached different codes for an occupation response an adjudicator would decide on the correct code and a discrepancy would be recorded whenever the initial coder and the adjudicator disagreed. These discrepancy reports were used to set occupation discrepancy rates for coders.

Discrepancy profile tables could also be produced to examine which ASCO codes had been determined by the adjudicator and which codes had been incorrectly allocated by the system through the coders' work. Unlike the discrepancy reports these tables recorded discrepancies made by the initial coder as well as the QM coder so that two discrepancies could be recorded for one occupation response if the adjudicator disagreed with both the initial coder and the QM coder. These tables have been used for the following analyses of discrepancies as they present more detailed information.

Tables showing the highest frequencies of discrepancies at each level of the ASCO classification, major, sub-major, minor and unit groups, are presented below. The unit groups (4-digit level) and the occupations (6-digit level) have been consolidated to the 4-digit level.

In order to determine which, amongst the ASCO groups, were more prone to coding discrepancies, a normalised crude discrepancy ratio has been calculated for each table. First the frequency of discrepancies for each group in the table has been divided by the

total number of persons employed in that group in the labour force. Then the group with the smallest proportion of discrepancies to labour force count was used as a normaliser and was given a value of 1.0.

$$\frac{\text{Frequency of discrepancies}}{\text{Frequency in labour force}} * \frac{\text{Frequency in labour force}}{\text{Frequency of discrepancies}} = 1.0$$

Finally the normalised discrepancy ratio for each group in the table was calculated by multiplying its frequency of discrepancies over its frequency in labour force by the frequency in labour force over frequency of discrepancies for the chosen normaliser.

3.3.2 Discrepancies caused by queries

Queries are raised when the information in the census form is inadequate to allocate a code. In many cases, the coding system will prompt the coder to raise a query. The query is sent for resolution by an expert coding group which has access to a wider range of material than is available to the front line coders.

Two types of discrepancies may arise through this process:

- queries not raised when they are required:

  Tables 4, 5, 6 and 7 will show that the most frequent type of discrepancy at all levels of classification was the result of queries not being raised when they were required. The proportion of discrepancies due to a query not being raised varied from 34.1 % of all discrepancies at the major group level to 23.5 % at the unit group level. No information is available as to whether the code allocated incorrectly during processing would have differed from a code that might have been allocated during the query resolution process.

- queries raised when they are not required:

  where queries were raised when they were not required, it can be assumed that the correct code was allocated during the query resolution process by the expert coders. These queries had no effect on the quality of occupation data and they therefore have been excluded from the analysis of discrepancies which follows. However, the fact that they had been raised in the first place implies that coders' training could be improved. It is therefore relevant to analyse which data caused problems to coders.

Table 3 : Most Queried Unit Groups

Code	*Unit group*	*Number of queries*	*% of total number of queries*
8211	Sales Assistants	1,652	4.7
6111	General Clerks	1,013	2.9
3311	Shop Managers	788	2.3
1000	Managers and Administrators	739	2.1
5111	Secretaries and Personal Assistants	730	2.1
3292	Project and Program Administrators	684	2.0
1222	Production Managers	521	1.5
7200	Intermediate Machine Operators	477	1.4
6211	Sales Representatives	458	1.3
3291	Office Managers	407	1.2

The most queried unit group was 'Sales Assistants'. 1,652 queries out of a total of 34,892 codeable queries (4.7 per cent) were incorrectly raised. The second most queried unit group was 'General Clerks' with 2.9 per cent of codeable queries. 'Shop Managers' was the third most queried unit group with 2.3 per cent of codeable queries.

The major reason for these queries is likely to have been the responses in the census forms. Incomplete, inaccurate or confusing information may prevent coders from following correct procedures leading to the allocation of codes. The answers in Q33 about 'Tasks' may not have matched the lists of tasks presented on the coders' screens and they may have felt that they were unable to make a selection.

It should be noted as well that very large numbers of people were employed in these unit groups: there were 384,828 'Sales Assistants' (5.0 per cent of the work force and the largest group in Australia), 186,052 'General Clerks' and 160,694 'Shop Managers'. High frequency of these unit groups provide more occasions for coders to misinterpret answers or raise queries.

3.3.3 Major groups (1-digit) discrepancies

The most serious level of discrepancies occurred when an occupation response was coded to an incorrect major group. The discrepancy profile table at the major group level contained 105,437 discrepancies where the adjudicator disagreed with either the initial coder or the QM coder. These discrepancies included 35,346 queries (33.5 per cent) which coders had raised incorrectly and which were resolved by QR staff. These queries are therefore removed from the total number of discrepancies.

Table 4 illustrates which major groups had been incorrectly allocated as a result of coders' selections.

Table 4 : Coding Discrepancies at the Major Group Level in order of Normalised Discrepancy Ratio, Australia, 1996 Census, All Major Groups

Correct major group						*Incorrectly allocated to*	
Major group and ASCO code	*Frequency in labour force*	*% of labour force*	*Frequency of discrepancies within code*	*% of total discrepancies (70,091)*	*Normalised discrepancy ratio* [1]	*Major group and ASCO code*	*Per cent*
Associate Profess'ls (3)	861,169	11.3	8,374	11.9	3.0		
						Managers & Administ'rs (1)	35.4
						Intermed. Clerical, Sales & Service Workers (6)	21.2
						Professionals (2)	12.8
Managers & Administ'rs (1)	709,925	9.3	6,032	8.6	2.6		
						Associate Professionals (3)	31.4
						Intermed. Clerical, Sales & Service Workers (6)	21.0
						Professionals (2)	18.9
Advanced Cler'l & Service Workers (5)	329,844	4.3	2,524	3.6	2.4		
						Intermed. Clerical, Sales & Service Workers (6)	45.7
						Managers & Administ'rs (1)	16.8
						Associate Professionals (3)	14.7
Interm. Clerical, Sales & Service Workers (6)	1,222,735	16.0	9,027	12.9	2.3		
						Associate Professionals (3)	22.1
						Element. Clerical, Sales & Service Workers (8)	18.3
						Professionals (2)	14.9
Interm. Prod'n & Transport Workers (7)	661,425	8.7	3,640	5.2	1.7		
						Labourers & Rel'd Workers (9)	29.5
						Intermed. Clerical, Sales & Service Workers (6)	21.1
						Tradespersons & Rel'd Workers (4)	13.1
Elem. Clerical, Sales & Service Workers (8)	677,395	8.9	3,681	5.3	1.7		
						Intermed. Clerical, Sales & Service Workers (6)	36.2

						Interm. Prod'n & Transp't W'kers (7)	16.4
						Labourers & Rel'd Workers (9)	14.9
Labourers & Rel'd W'krs (9)	667,250	8.7	3,142	4.5	1.5		
						Interm. Prod'n & Transp't W'kers (7)	27.6
						Tradespersons & Rel'd Workers (4)	22.6
						Element. Clerical, Sales & Service Workers (8)	10.3
Professionals(2)	1,309,468	17.1	5,005	7.1	1.2		
						Intermed. Clerical, Sales & Service Workers (6)	26.9
						Managers & Administ'rs (1)	24.6
						Associate Professionals (3)	20.8
Tradespersons & Related Workers (4)	997,010	13.1	3,205	4.6	1.0		
						Labourers & Rel'd Workers (9)	19.7
						Associate Professionals (3)	18.4
						Interm. Prod'n & Transp't W'kers (7)	15.0
Inadequately Described (0)	71,503	0.9	1,090	1.6	NA		
						Managers & Administ'rs (1)	17.9
						Intermed. Clerical, Sales & Service Workers (6)	16.9
						Not Stated	15.0
Not Stated	128,595	1.7	315	0.4	NA		
						Inadequately Described (0)	18.4
						Interm. Clerical, Sales & Service Workers (6)	14.3
						Professionals (2)	12.1
A Query should have been raised	NA	NA	23,890	34.1	NA		
						Managers & Administ'rs (1)	15.0
						Professionals (2)	15.0
						Associate Professionals (3)	15.0

[1] The normalised discrepancy ratio for 'Tradespersons and Related Workers' = 3,205/997,010 * 997,010/3,205 = 1.0. Therefore the normalised discrepancy ratio for 'Associate Professionals' =

8,374/861,169 * 997,010/3,205 = 3.0.
NA Not Applicable.

Major group (3) 'Associate Professionals' recorded the highest normalised discrepancy ratio (3.0). Most discrepancies were coded within major group (1) 'Managers and Administrators' (35.4 per cent), and within major group (6) 'Intermediate Clerical, Sales and Service Workers (21.2 per cent). They also were coded within major group (2) 'Professionals' (12.8 per cent).

Major group (1) 'Managers and Administrators' recorded the second highest normalised discrepancy ratio (2.6). Most discrepancies were coded within major group (3) 'Professionals' (31.4 per cent), within major group (6) 'Intermediate Clerical, Sales and Service Workers' (21.0 per cent), and within major group (2) 'Professionals' (18.9 per cent).

The incorrect allocations of responses to major groups listed above indicate that coders had difficulties distinguishing between major group (1) 'Managers and Administrators' and major group (6) 'Intermediate Clerical, Sales and Service Workers'. Other severe discrepancies in the table include responses which should have been coded to major group (5) 'Advanced Clerical and Service Workers' but were coded instead to major group (1) 'Managers and Administrators', and responses which should have been coded to major group (2) 'Professionals' but were coded instead to major group (6) 'Intermediate Clerical, Sales and Service Workers'.

There were 1,090 responses (1.6% of all discrepancies) which should have been allocated an 'inadequate response' code. 17.9 per cent of those responses were coded to codes within the major group (1) 'Managers and Administrators' and 16.9 per cent to codes within the major group (6) 'Intermediate Clerical, Sales and Service Workers'.

23,890 queries (34.1 per cent of discrepancies) should have been raised if the coders had followed the correct procedures. The codes allocated instead were within major group (1) 'Managers and Administrators', major group (2) 'Professionals', and major group (3) 'Associate Professionals' (each 15.0 per cent of the number of queries).

3.3.4 Sub-major groups (2-digit) discrepancies

The discrepancy profile table at the sub-major group level contained 116,973 discrepancies where the adjudicator disagreed with either the initial coder or the QM coder. These discrepancies included 35,349 queries (30.2 per cent) which coders had raised incorrectly and which were resolved by QR staff. These queries are therefore removed from the total number of discrepancies.

Table 5 : Coding Discrepancies at the Sub-major Group Level in order of Normalised Discrepancy Ratio, Australia, 1996 Census, for the Classifications with the Ten Highest Discrepancy Frequencies

Correct sub-major group						*Incorrectly allocated to*	
Sub-major group and ASCO code	*Frequency in labour force*	*% of labour force*	*Frequency of discrepancies within code*	*% of total discrepancies (81,624)*	*Normalised discrepancy ratio* [1]	*Sub-major group and ASCO code*	*Per cent*
Specialist Managers (12)	297,752	3.9	5,011	6.1	3.1		
						Managers & Admin's nfd (10)	18.3
						Intermed. Sales & Rel'd Workers (62)	14.6
						Business & Inform. Professionals (22)	11.2
Interm. Sales & Related Workers (62)	141,313	1.9	2,249	2.8	2.9		
						Elementary Sales Workers (82)	29.6
						Business & Inform. Profes'ls (22)	19.8
						Specialist Managers (12)	14.8
Man'g Superv's (Sales & Service) (33)	337,244	4.4	4,352	5.3	2.3		
						Managers & Admin's nfd (10)	21.2
						Specialist Managers (12)	13.1
						Intermed. Sales & Rel'd Workers (62)	9.7
Business & Admin. Assoc. Prof'ls (32)	263,081	3.4	3,305	4.0	2.3		
						Intermed. Clerical Workers (61)	24.2
						Specialist Managers (12)	15.6
						Managers & Admin's nfd (10)	12.3
Factory Labourers (92)	156,930	2.1	1,671	2.0	1.9		
						Labourers & Rel'd Workers nfd (90)	28.7
						Intermed. Machine Operators (72)	17.4
						Other Labourers & Rel'd Workers (99)	14.7
Busin. & Info. Profes'ls (22)	342,284	4.5	3,239	4.0	1.7		
						Intermed. Sales & Rel'd Workers (62)	19.3
						Specialist Managers (12)	15.5

						Intermed.Clerical Workers (61)	9.4
Interm. Clerical Workers (61)	685,702	9.0	5,562	6.8	1.5		
						Business & Admin. Associate Professionals (32)	21.0
						Other Advanced Clerical & Service Workers (59)	15.7
						Inadequately Described (09)	7.7
Other Labourers & Related Workers (99)	287,065	3.8	2,370	2.9	1.5		
						Labourers & Rel'd Workers nfd (90)	14.6
						Factory Labourers (92)	8.4
						Skilled Agricult. & Horticulture Workers (46)	7.8
Element. Sales Workers (82)	516,840	6.8	2,839	3.5	1.0		
						Interm. Sales & Rel'd Workers (62)	15.9
						Other Interm. Prod. & Transport Workers (79)	13.0
						Other Labourers & Rel'd Workers (99)	10.3
A Query should have been raised	NA	NA	23,890	29.3	NA		
						Intermed. Clerical Workers (61)	8.0
						Specialist Managers (12)	7.0
						Business & Admin. Associate Professionals (32)	6.0

[1] The normalised discrepancy ratio for 'Elementary Sales Workers' = 2,839/516,840 * 516,840/2,839 = 1.0. Therefore the normalised discrepancy ratio for 'Specialist Managers' = 5,011/297,752 * 516,840/2,839 = 3.1.

NA Not Applicable.

Sub-major group (12) 'Specialist Managers' recorded the highest discrepancy ratio (3.1) for the ten sub-major groups with most discrepancies. Responses were coded to codes within sub-major group (10) 'Managers and Administrators nfd' 915 times (18.3 per cent) out of 5,011 discrepancies. 14.6 per cent of the discrepancies recorded for 'Specialist Managers' were codes allocated to sub-major group (62) 'Intermediate Sales and Related Workers', and 11.2 per cent were codes allocated to sub-major group (22) 'Business and Information Professionals'.

'Intermediate Sales and Related Workers' (62) recorded the second highest discrepancy ratio (2.9). High percentages of discrepancies were coded to sub-major group (82) 'Elementary Sales Workers' (29.6 per cent), sub-major group (22) 'Business and Information Professionals' (19.8 per cent), and sub-major group (12) 'Specialist Managers' (14.8 per cent).

'Managing Supervisors (Sales and Service)' (33) recorded the third highest discrepancy ratio (2.3). High percentages of discrepancies were coded to sub-major group (10) 'Managers and Administrators' (21.2 per cent), sub-major group (12) 'Specialist Managers' (13.1 per cent), and sub-major group (62) 'Intermediate Sales and Related Workers' (9.7 per cent).

The confusion between major group (1) 'Managers and Administrators' and major group (6) 'Intermediate Clerical, Sales and Service Workers' (refer to section 3.3.3) is apparent again at the sub-major group level. Sub-major group (12) 'Specialist Managers' and sub-major group (62) 'Intermediate Sales and Related Workers' appear interchangeably as correct or incorrect codes in the table. Responses which should have been coded to sub-major groups (33) 'Managing Supervisors (Sales and Service)', (32) 'Business and Administrative Associate Professionals' and (22) 'Business and Information Professionals' were coded instead to sub-major groups (10) 'Managers and Administrators nfd', (12) 'Specialist Managers', (61) 'Intermediate Clerical Workers', or (62) 'Intermediate Sales and Related Workers'.

At the sub-major group level the 23,890 queries which should have been raised by coders accounted for 29.3 per cent of all discrepancies. The codes most often allocated were within the sub-major groups (61) 'Intermediate Clerical Workers', (12) 'Specialist Managers' and (32) 'Business and Administrative Associate Professionals'.

3.3.5 Minor groups (3-digit) discrepancies

The discrepancy profile table at the minor group level contained 126,950 discrepancies where the adjudicator disagreed with either the initial coder or the QM coder. These discrepancies included 35,313 queries (27.8 per cent) which coders had raised incorrectly and which were resolved by QR staff. These queries are therefore removed from the total number of discrepancies.

Table 6 : Coding Discrepancies at the Minor Group Level in order of Normalised Discrepancy Ratio, Australia, 1996 Census, for the Classifications with the Twenty Highest Discrepancy Frequencies

	Correct minor group					*Incorrectly allocated to*	
Minor group and ASCO code	*Frequency in labour force*	*% of labour force*	*Frequency of discrepancies within code*	*% of total discrepancies (91,637)*	*Normalised discrepancy ratio* [1]	*Minor group and ASCO code*	*Per cent*
Sales & Mark'g Managers (123)	63,159	0.8	1,762	1.9	5.0		
						Intermed. Sales & Related Workers (621)	37.4
						Managers & Admin's nfd (100)	12.2
						Sales, Mark'g & Advertising Professionals (222)	11.0
Managers & Admin's nfd (100)	77,152	1.0	1,696	1.9	3.9		
						Misc. Business & Administ. Assoc. Professionals (329)	12.7
						Gen'l Managers & Administ's (111)	11.7
						Engineering, Distrib'n & Proc. Managers (122)	8.8
Misc. Manager Superv's (Sales & Serv.) (339)	80,498	1.1	1,568	1.7	3.5		
						Road & Rail Transp't Drivers (731)	13.4
						Managers & Admin's nfd (100)	13.3
						Shop Managers (331)	9.2
Misc.Intermed. Clerical Workers (619)	79,913	1.0	1,514	1.7	3.4		
						General Clerks (611)	24.8
						Interm. Numerical Clerks (614)	11.0
						Sales Assistants (821)	9.2
Shop Managers (331)	160,694	2.1	2,732	3.0	3.1		
						Managers & Admin's nfd (100)	19.8
						Intermed. Sales & Related Workers (621)	13.1
						Sales Assistants (821)	9.7

Eng'g, Distr'n & Process Managers (122)	81,963	1.1	1,366	1.5	3.0		
						Managers & Admin's nfd (100)	23.2
						Gen'l Managers & Admin's (111)	8.7
						Misc.Business & Admin. Associate Profession'ls (329)	8.6
Interm. Sales & Related Workers (621)	141,316	1.9	2,248	2.4	2.9		
						Sales Assistants (821)	24.9
						Sales, Marketing & Advertising Professionals (222)	18.5
						Sales & Marketing Managers (123)	12.9
General Clerks (611)	186,052	2.4	2,872	3.1	2.8		
						Misc. Business & Admin. Associate Professionals (329)	16.5
						Keyboard Operators (612)	13.1
						Misc. Intermediate Clerical Workers (619)	7.7
Material Recording & Despatch Clerks (615)	81,547	1.1	1,218	1.3	2.7		
						Misc. Intermediate Prod'n & Transp't Workers (799)	21.5
						General Clerks (611)	20.4
						Inadequately Described (099)	6.6
Inadequately Described (099)	71,503	0.9	1,090	1.2	2.7		
						Not Stated	15.0
						Farmers & Farm Managers (131)	9.3
						Cleaners (911)	5.2
Misc. Specialist Managers (129)	81,923	1.1	1,182	1.3	2.6		
						Managers & Admin. nfd (100)	12.0
						Gen'l Managers & Administr'rs (111)	8.3
						Misc. Business & Admin. Associate Professionals (329)	6.9
Misc. Bus's & Admin. Assoc. Profes'ls (329)	206,321	2.7	2,921	3.2	2.5		

						General Clerks (611)	13.4
						Managers & Administ'rs (100)	12.5
						Resource Managers (121)	6.4
Process Workers (921)	106,887	1.4	1,496	1.6	2.5		
						Labourers & Related Workers (900)	29.6
						Interm. Machine Operators (720)	11.8
						Misc. Labourers & Related Workers (999)	9.0
Misc. Element. Sales Workers (829)	128,596	1.7	1,695	1.8	2.4		
						Sales Assistants (821)	34.5
						Element. Sales Workers nfd (820)	6.3
						Intermed. Sales & Related Workers (621)	5.0
Intermediate Numerical Clerks (614)	169,797	2.2	2,070	2.3	2.2		
						General Clerks (611)	24.3
						Advanced Numerical Clerks (591)	22.4
						Misc. Intermediate Clerical Workers (619)	9.2
Misc. Interm. Prod'n & Transport Workers (799)	145,941	1.9	1,771	1.9	2.2		
						Material Recording & Despatching Clerks (615)	31.5
						Sales Assistants (821)	12.4
						Product Packagers (922)	8.6
Misc. Business & Information Prof'ls (229)	102,866	1.3	1,063	1.2	1.8		
						Professionals. nfd (200)	8.7
						Misc. Business & Admin. Associate Professionals (329)	7.0
						Inadequately Described (099)	6.6
Sales Assistants (821)	348,828	5.0	2,680	2.9	1.3		

						Intermediate Sales & Related Workers (621)	13.6
						Misc. Interm. Prod. & Transport Workers (799)	11.9
						Misc. Elem. Sales Workers (829)	11.6
Secretaries & Personal Assistants (511)	199,436	2.6	1,111	1.2	1.0		
						Receptionists (613)	22.1
						General Clerks (611)	14.7
						Managers & Admin. nfd (100)	7.5
A Query should have been raised	NA	NA	23,890	26.1	NA		
						Misc. Business & Admin. Associate Professionals (329)	5.0
						Inadequately Described (099)	5.0
						Managers & Admin. nfd (100)	4.0

[1] The normalised discrepancy ratio for 'Secretaries and Personal Assistants' = 1,111/199,436 * 199,436/1,111 = 1.0. Therefore the normalised discrepancy ratio for 'Sales and Marketing Managers' = 1,762/63,159 * 199,436/1,111 = 5.0.

NA Not Applicable.

The discrepancy ratio for the twenty minor groups with the highest number of discrepancies ranged from 5.0 for 'Sales and Marketing Managers' (123) to 1.0 for 'Secretaries and Personal Assistants' (511).

High percentages of discrepancies in the minor group (123) 'Sales and Marketing Managers' were allocated codes to minor groups (621) 'Intermediate Sales and Related Workers' (37.4 per cent), (100) 'Managers and Administrators' (12.2 per cent), and (222) 'Sales, Marketing and Advertising Professionals' (11.0 per cent).

'Managers and Administrators' (100) recorded the second highest discrepancy ratio (3.9). High percentages of discrepancies were coded to minor groups related to managers and/or administrators.

'Miscellaneous Manager Supervisors (Sales and Service)' (339) recorded the third highest discrepancy ratio (3.5). High percentages of discrepancies were coded to minor groups 'Managers and Administrators' (100) (13.3 per cent) and 'Shop Managers' (331) (9.2 per cent) as well as 'Road and Rail Transport Drivers' (731) with 13.4 per cent.

Confusion between minor groups (100) 'Managers and Administrators' and (123) 'Sales and Marketing Managers'on one hand, and minor groups (611) 'General Clerks' and (621) 'Intermediate Sales and Related Workers' on the other hand was again noticeable (refer to sections 3.3.3 and 3.3.4).

3.3.6 Unit groups (4-digit) discrepancies

The discrepancy profile table at the unit group level contained 136,575 discrepancies where the adjudicator disagreed with either the initial coder or the QM coder. These discrepancies included 34,892 queries (25.5 per cent) which coders had raised incorrectly and which were resolved by QR staff. These queries are therefore removed from the total number of discrepancies.

Table 7 : Coding Discrepancies at the Unit Group Level in order of Normalised Discrepancy Ratio, Australia, 1996 Census, for the Classifications with the Twenty Highest Discrepancy Frequencies

Correct unit group						*Incorrectly allocated to*	
Unit group and ASCO code	*Frequency in labour force*	*% of labour force*	*Frequency of discrepancies within code*	*% of total discrepancies (101,683)*	*Normalised discrepancy ratio* [1]	*Unit group and ASCO code*	*Per cent*
Mixed Crop & Livestock Farmers (1311)	34,956	0.5	1,048	1.0	5.4		
						Farmers & Farm Managers nfd (1310)	59.7
						Livestock Farmers (1312)	19.8
						Crop Farmers (1313)	13.0
Sales & Marketing Manag's (1231)	63,159	0.8	1,762	1.7	5.0		
						Sales Represent's (6211)	36.6
						Managers and Administ's (1000)	12.2
						Technical Sales Represent's (2222)	7.7
Managers and Admin's (1000)	77,152	1.0	1,696	1.7	3.9		
						General Managers (1112)	11.7
						Shop Managers (3311)	8.1
						Office Managers (3291)	6.7
Accounting Clerks (6141)	58,142	0.8	1,295	1.3	3.9		
						Bookkeepers (5911)	29.0
						General Clerks (6111)	25.3
						Accountants (2211)	18.6
Other Man'g Superv (Sales & Service (3399)	41,910	0.5	832	0.8	3.6		
						Shop Managers (3311)	13.0
						Managers & Admin's nfd (1000)	12.1

						Office Managers (3291)	5.0
Office Managers (3291)	71,643	0.9	1,315	1.3	3.3		
						Managers and Admin's nfd (1000)	15.7
						Project & Program Administr's (3292)	9.4
						General Clerks (6111)	9.4
Project & Progr. Admin's (3292)	71,450	0.9	1,304	1.3	3.3		
						General Clerks (6111)	19.4
						Managers and Administr's nfd (1000)	8.7
						Office Managers (3291)	8.7
Keyboard Oper's (6121)	63,269	0.8	1,097	1.1	3.1		
						General Clerks (6111)	35.8
						Comput'g Support Technicians (6131)	17.5
						Receptionists (6131)	5.1
General Manag's (1112)	61,263	0.8	1,034	1.0	3.1		
						Managers & Administr's nfd (1000)	30.4
						Sales & Mark'g Managers (1231)	10.0
						Finance Managers (1211)	3.9
Shop Managers (3311)	160,694	2.1	2,732	2.7	3.1		
						Managers & Administr's nfd (1000)	19.8
						Sales Assistants (8211)	9.7
						Sales Represent's (6211)	8.3
Sales Repres's (6211)	102,657	1.3	1,721	1.7	3.0		
						Technical Sales Rep's (2222)	21.6
						Sales Assistants (8211)	21.5
						Sales & Marketing Managers (1231)	16.3
Stock &Purch'g Clerks (6153)	57,590	0.8	909	0.9	2.9		
						Storepersons (7993)	27.2

						General Clerks (6111)	17.9
						Sales Assistants (8211)	3.6
General Clerks (6111)	186,052	2.4	2,874	2.8	2.8		
						Keyboard Operators (6121)	13.0
						Project Administ's (3292)	9.8
						Receptionists (6131)	7.4
Prod'n Manag's (1222)	40,757	0.5	585	0.6	2.5		
						Managers and Administr's nfd (1000)	25.8
						Inadequately Described (0998)	13.2
						General Managers (1112)	8.5
Storepersons (7993)	106,768	1.4	1,393	1.4	2.3		
						Stock and Purchasing Clerks (6153)	39.1
						Sales Assistants (8211)	15.7
						Hand Packers (9221)	9.6
Bookkeepers (5911)	68,116	0.9	874	0.9	2.3		
						General Clerks (6111)	18.3
						Accountants (2211)	11.7
						Accounting Clerks (6141)	10.3
Interm. Mach. Op's nfd (7200)	64,360	0.8	686	0.7	2.0		
						Labourers & Rel'd Workers nfd (9000)	8.3
						Miners (7911)	8.0
						Engineering Prod'n Systems Workers (7123)	6.7
Sales Assistants (8211)	384,828	5.0	2,680	2.6	1.3		
						Storepersons (7993)	11.8
						Shop Managers (3311)	8.8
						Sales Repres's (6211)	7.8
Secretaries and Personal Assistants (5111)	199,436	2.6	1,111	1.1	1.0		
						Receptionists (6131)	22.1

						General Clerks (6111)	14.7
						Managers & Administrators nfd (1000)	7.5
A Query should have been raised	NA	NA	23,890	23.5	NA		
						Managers & Administrators nfd (1000)	4.0
						Sales Assistants (8211)	4.0
						Inadequately Described (0998)	4.0

[1] The normalised discrepancy ratio for 'Secretaries and Personal Assistants' = 1,111/199,436 * 199,436/1,111 = 1.0. Therefore the normalised discrepancy ratio for 'Mixed Crop and Livestock Farmers' = 1,048/34,956 * 199,436/1,111 = 5.4.

NA Not Applicable.

The discrepancy ratio for the twenty unit groups with the highest number of discrepancies ranged from 5.4 for 'Mixed Crop and Livestock Farmers' (1311) to 1.0 for 'Secretaries and Personal Assistants' (5111).

Most discrepancies for 'Mixed Crop and Livestock Farmers' (1311) were allocated codes for various types of farmers within the same minor group 'Farmers and Farm Managers' (131).

High percentages of discrepancies in the unit group 'Sales and Marketing Managers' (1231) were allocated codes to unit groups relating to 'Sales Representatives' (6211 and 2222) or 'Managers and Administrators'(1000).

The coding confusion between major groups (1) 'Managers and Administrators' and (6) 'Intermediate Clerical, Sales and Service Workers' is again obvious at the unit group level with six groups incorrectly allocated unit group codes belonging to both categories.

High percentages of discrepancies in the unit group 'Managers and Administrators' (1000) were allocated codes to unit groups relating to various types of managers.

4. RECONCILIATION OF 1996 CENSUS OCCUPATION DATA WITH LABOUR FORCE SURVEY DATA

4.1 Data Reconciliation Methodology

The purpose of this section is to explain the differences in the collection of occupation data between the labour force survey and the census, to outline the steps taken to reconcile these two data collections and to present the findings from this reconciliation. The methodology used to reconcile census and labour force survey data is derived from an internal paper prepared by the Research and Development group within the Labour Force section of the Australian Bureau of Statistics.

Although the census and labour force survey both collect data on occupation, they are not strictly comparable due to differences in the scope, coverage, timing, measurement of underlying labour force concepts and collection methodology. Factors contributing to differences in estimates include under-enumeration in the census for which census occupation data have not been adjusted, the use in the labour force survey of population benchmarks derived from incomplete information about population change, differing methods of adjustment for non-response to the survey or census, the personal interview approach adopted in the survey as opposed to self-enumeration in the census, and sampling variability.

Differences in the underlying definition of 'employed' between the two collections should also be borne in mind when comparing figures. Census questions are not as detailed, nor as comprehensive as the labour force survey questions. This is largely due to space limitations on the census form, as well as constraints imposed by self-enumeration. The differences in definition of 'employed' between the two collections relate specifically to absences from work. To determine the labour force status of persons absent from work without pay, the survey applies a test of duration of absence from work. Therefore, a respondent who had been away from work for four weeks or more without pay is regarded as not employed. By contrast, the census does not apply tests of duration for absence from work, and as a result, all persons away from work are most likely to be classified as employed. This of course depends on how the respondent has completed the census form. As a consequence a proportion of census respondents would be regarded as employed by the census whereas these same respondents would be regarded as unemployed or not in the labour force by the labour force survey. As there is no clear way of identifying the occupation of persons classified as employed by the census but unemployed or not in the labour force by the survey, it is not possible to remove this population from the census data. Investigations revealed that there were an estimated 81,730 persons who fell into this category in the August 1996 Labour Force Survey.

To enable reconciliation, the scopes of the 1996 Census and the August 1996 Labour Force Survey were first reduced to a common population. Table 8 below shows the adjustments made to August 1996 Labour Force Survey benchmarks and to 1996 Census for occupation data comparison. For more information on the process used to compare census and labour force survey data please refer to Census Working Paper 99/2, *1996 Census: Labour Force Status*.

Table 8 : Adjustments made to August 1996 Labour Force Survey Benchmarks and 1996 Census to derive a Common Population for Occupation Data

Population group	*Number*	*Benchmarks*	*Census*
Jervis Bay Territory and external territories	2,029		deducted
Visitors to Australia	125,406		deducted
Defence Force Personnel	72,914		deducted
Not enumerated in Census	239,200	deducted	
Residents temporarily overseas	270,155	deducted	
Not stated for occupation	128,595		deducted

4.2 Results of Data Reconciliation

The following analyses are based on the 1996 Census of Population and Housing and the August 1996 Labour Force Survey. Comparisons by major occupation groups and age groups, and comparisons by major occupation groups and States are presented below.

The census used the additional category 'Inadequately Described' when occupation responses could not be allocated ASCO codes. The interviewer-based Labour Force survey did not require such a category. 70,423 census responses were therefore not distributed within major groups and contributed to the differences between both collections.

4.2.1 Data Comparison of Occupation Major Groups by Age

Adjusted August 1996 Labour Force Survey figures for total employed persons were 2.9 per cent (or an estimated 225,292 persons) higher than the figures for the 1996 Census. The 3 Standard Error estimates (27,018 for total employed) indicate that the differences between the adjusted data were statistically significant. This means that one can be more than 99.7 per cent confident that the remaining differences after adjustment between the census and the labour force survey were not merely due to sampling variability in the labour force survey data.

The following table presents the percentage differences in counts/estimates between the two collections. Tables A1 and A2 in Appendix 6 show the adjusted figures used to derive the percentage differences.

Table 9 : Major Occupation Groups by Age, Percentage Differences between 1996 Census and August 1996 Labour Force Survey for Persons, Australia

Occupation major group	*Age group*						
	15-19	*20-24*	*25-34*	*35-44*	*45-54*	*55 and over*	*Total*
Managers and Administrators	223.9	109.4	38.6	19.3	18.1	5.6	21.7
Professionals	25.6	2.3	0.9	-0.8	4.0	2.6	1.4
Associate Professionals	17.6	9.9	9.8	6.4	0.7	5.3	6.2
Tradespersons and Related Workers	4.9	-6.2	-8.2	-9.5	-6.2	-1.9	-6.5
Advanced Clerical and Service Workers	-4.1	-15.8	-5.9	-13.3	-16.2	-12.9	-12.1
Intermediate Clerical, Sales and Service Workers	-8.6	-6.1	-7.1	-2.3	-6.8	-8.9	-5.9
Intermediate Production and Transport Workers	-12.9	-19.5	-6.7	-8.7	-6.9	-12.0	-9.6
Elementary Clerical, Sales and Service Workers	-18.5	-18.1	-12.3	-18.1	-10.3	-9.4	-15.4
Labourers and Related Workers	-34.6	-7.6	-14.2	-10.3	-2.4	-13.4	-13.6
Inadequately Described	NA	NA	NA	NA	NA	NA	NA
Australia	**-14.7**	**-5.5**	**-1.7**	**-2.1**	**-0.4**	**-2.0**	**-2.9**

NA Not Applicable.

The table shows that the greatest differences appeared in the younger age groups. The number of 15-19 year olds in the Census who were employed and stated an occupation was 14.7 per cent lower than the number in the Labour Force Survey. Census counts were 5.5 per cent lower among the 20-24 year olds.

The major group 'Managers and Administrators' recorded the largest percentage difference between both collections: the Census count was 21.7 per cent higher than the Labour Force Survey estimates. The second largest difference was attributable to the major group 'Elementary Clerical, Sales and Service Workers' where the Census count was 15.4 per cent lower than the Labour Force Survey estimates.

Within cross categories 'major groups by age', differences in percentages were largest among 'Managers and Administrators' 15-19 year old (223.9 per cent higher in Census with a count of 4,654 persons), 20-24 year old (109.4 per cent higher in Census with a count of 24,158 persons) and 25-34 year old (38.6 per cent higher in Census with a count of 134,142 persons). There was a 34.6 per cent difference for 'Labourers and Related Workers' 15-19 year old where the Census counts were lower than the Labour Force estimates with 79,777 persons.

It should be noted that 15-19 year old and 20-24 year old 'Managers and Administrators' were represented by very small groups which exaggerate the percentage differences.

4.2.2 Comparison of Occupation Major Groups by Age, 1996 Census and August 1996 Labour Force Survey

Tables A1 and A2 in Appendix 6 provide adjusted figures by Age for both collections. The rates in Tables 10 and 11 have been calculated as proportions of the total number of persons employed in the labour force.

Table 10 : Percentage Rates for Occupation Major Groups by Age, Persons, Australia, 1996 Census

Occupation major group	*Age group*						
	15-19	*20-24*	*25-34*	*35-44*	*45-54*	*55 and over*	*Total*
Managers and Administrators	0.1	0.3	1.8	2.8	2.7	1.7	9.4
Professionals	0.1	1.5	4.9	5.5	3.9	1.5	17.5
Associate Professionals	0.2	1.0	3.1	3.3	2.7	1.1	11.4
Tradespersons and Related Workers	1.0	2.0	3.7	3.2	2.3	1.1	13.1
Advanced Clerical and Service Workers	0.1	0.5	1.2	1.2	1.0	0.4	4.4
Intermediate Clerical, Sales and Service Workers	1.0	2.7	4.4	4.1	3.1	1.1	16.3
Intermediate Production and Transport Workers	0.5	0.9	2.3	2.4	1.9	0.9	8.8
Elementary Clerical, Sales and Service Workers	2.2	1.5	1.7	1.6	1.4	0.7	9.1
Labourers and Related Workers	1.1	1.1	2.0	2.1	1.8	0.9	9.0
Inadequately Described	0.0	0.1	0.2	0.3	0.2	0.1	0.9
Total							**100.0**

Table 11 : Percentage Rates for Occupation Major Groups by Age, Persons, Australia, August 1996 Labour Force Survey Data

Occupation major group	*Age group*						
	15-19	*20-24*	*25-34*	*35-44*	*45-54*	*55 and over*	*Total*
Managers and Administrators	0.0	0.2	1.3	2.3	2.2	1.6	7.5
Professionals	0.1	1.4	4.7	5.4	3.7	1.4	16.7
Associate Professionals	0.2	0.9	2.7	3.0	2.6	1.0	10.4
Tradespersons and Related Workers	0.9	2.1	3.9	3.4	2.3	1.1	13.6
Advanced Clerical and Service Workers	0.1	0.6	1.3	1.3	1.2	0.4	4.9
Intermediate Clerical, Sales and Service Workers	1.0	2.7	4.6	4.1	3.2	1.2	16.8
Intermediate Production and Transport Workers	0.6	1.1	2.4	2.5	2.0	1.0	9.5
Elementary Clerical, Sales and Service Workers	2.7	1.8	1.9	1.9	1.5	0.7	10.4
Labourers and Related Workers	1.6	1.2	2.3	2.3	1.8	1.0	10.1
Inadequately Described	NA	NA	NA	NA	NA	NA	NA
Total							**100.0**

NA Not Applicable.

The major group 'Managers and Administrators' recorded the largest percentage rate difference with 9.4 per cent for the Census and 7.5 per cent for the Labour Force Survey. The 25-34, 35-44 and 45-54 age groups all recorded a 0.5 per cent difference between collections with higher percentage rates in the Census.

The major groups 'Elementary Clerical, Sales and Service Workers' and 'Labourers and Related Workers' recorded lower percentage rates in the Census (9.1 per cent and 9.0 per cent respectively in the Census, and 10.4 per cent and 10.1 per cent respectively in the Labour Force Survey) mainly attributable to the 15-19 age group.

Even though the differences between figures for both collections were statistically significant, the percentage rates comparison shows an overall similarity in the distribution of data.

4.2.3 Comparison of Occupation Major Groups by State, 1996 Census and August 1996 Labour Force Survey

Tables A3 and A4 in Appendix 6 provide adjusted figures by State for both collections. The percentage rates in Tables 12 and 13 have been calculated as proportions of the total number of persons employed in the labour force in each State.

Table 12 : Percentage Rates for Occupation Major Groups by State, Persons, Australia, 1996 Census

Occupation major group	*States*							
	NSW	*Vic.*	*Qld*	*SA*	*WA*	*Tas.*	*NT*	*ACT*
Managers and Administrators	9.3	9.7	8.9	10.1	9.5	9.5	7.8	10.6
Professionals	18.2	18.1	15.3	16.8	16.3	16.7	17.5	26.1
Associate Professionals	11.2	11.5	11.6	10.9	11.5	10.6	12.3	12.4
Tradespersons and Related Workers	12.8	13.1	13.6	13.1	14.3	13.9	13.0	8.8
Advanced Clerical and Service Workers	5.0	4.4	4.1	3.8	4.4	3.3	3.7	3.3
Intermediate Clerical, Sales and Service Workers	16.5	15.6	16.6	16.5	16.0	16.6	16.9	19.1
Intermediate Production and Transport Workers	8.6	9.0	9.2	9.0	9.0	9.8	7.3	4.3
Elementary Clerical, Sales and Service Workers	9.0	9.1	9.7	8.7	8.7	9.0	8.3	9.3
Labourers and Related Workers	8.4	8.4	10.1	10.3	9.3	9.7	12.0	4.6
Inadequately Described	0.9	1.0	0.9	0.8	0.9	1.0	1.3	1.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 13 : Percentage Rates for Occupation Major Groups by State, Persons, Australia, August 1996 Labour Force Survey Data

Occupation major group	*States*							
	NSW	*Vic.*	*Qld*	*SA*	*WA*	*Tas.*	*NT*	*ACT*
Managers and Administrators	7.1	8.0	7.5	8.8	6.9	6.1	7.4	10.3
Professionals	18.0	17.1	14.8	15.6	15.3	14.4	15.3	24.0
Associate Professionals	10.2	9.8	10.6	10.8	11.7	8.7	13.4	11.6
Tradespersons and Related Workers	13.1	13.8	14.1	13.1	15.5	13.5	12.2	9.3
Advanced Clerical and Service Workers	5.9	4.6	4.7	4.2	4.4	2.1	2.0	4.3
Intermediate Clerical, Sales and Service Workers	16.3	16.3	17.5	17.9	15.8	20.1	19.7	21.0
Intermediate Production and Transport Workers	9.4	10.3	9.5	9.0	8.8	10.7	9.6	5.2
Elementary Clerical, Sales and Service Workers	10.8	10.1	10.9	9.3	10.3	11.3	8.7	9.7
Labourers and Related Workers	9.4	9.9	10.5	11.2	11.2	13.1	11.7	4.7
Inadequately Described	NA	NA	NA	NA	NA	NA	NA	NA
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

NA Not Applicable.

The major differences in percentage rates between the two collections occurred primarily in Tasmania and the Northern Territory. Other noticeable differences occurred in Western Australia and the Australian Capital Territory. This may reflect sampling variability in smaller States in the Labour Force Survey. The percentage rates differences for 'Managers and Administrators' and 'Professionals' in all States were higher in the Census whereas percentage rates differences for 'Intermediate Clerical, Sales and Service Workers', 'Intermediate Production and Transport Workers', 'Elementary Clerical, Sales and Service Workers' and 'Labourers and Related Workers' were mainly lower in the Census.

However the differences in percentage rates between both collections were generally within 2 per cent which indicates that the distribution of data was generally consistent.

5. TOWARDS 2001 : PROPOSED CHANGES AND RECOMMENDATIONS

5.1 Form Content

The questions about 'Job title' and 'Main tasks' will contain additional examples: 'Sheep and Wheat Farmer' and 'running a sheep/wheat farm'. The aim is to reduce the number of respondents answering 'Farmer' 'farming' which led to the allocation of the Not Further Defined ASCO code 131 'Farmers and Farm Managers' in 1996 Census.

There will be two industry questions which could help coders for the coding of occupation data where required. The first industry question will ask: 'Which best describes the business of the employer?' A new question: 'What are the main goods produced or main services provided by the employer's business?' has been designed to provide additional information.

5.2 Coding Procedures

A new system will be introduced for data capture of census forms. The Intelligent Character Recognition (ICR) system will scan the census forms, read the hand-printed data, verify and correct the data read from the form, and store the form image and data for additional processing. Then automatic coding will be undertaken. It is expected that many occupations will be automatically coded from the title response. Responses not automatically coded will undergo Computer Assisted Coding (CAC) similar to that used in the 1996 Census. The system will be modified so that images can be displayed, and all coding carried out from the images of the census forms.

5.3 Index Entries

About 3,000 entries were progressively added to the ASCO master coding index during 1996 processing as a result of issues raised by coders, Quality Improvement Teams and Query Resolution staff. Although these new entries will improve occupation data coding for the 2001 Census, occupational changes in the Australian labour market necessitate the creation of new indexes on a continuous basis. Tests conducted before the census contribute to this continuous reviewing process and the actual census processing will certainly uncover new needs for index updating.

In addition to changes in the labour market the introduction of Automatic Coding for occupation data requires enhancements of the ASCO index in order to produce basic and qualifying word matches. Trials are presently under way to assess the extent and the kind of index changes required.

5.4 Training

As mentioned in section 3.3.2 the discrepancy rate for occupation data peaked twice at times corresponding to the start of processing by the two largest intakes of coders. Suggestions were made after 1996 processing that training smaller numbers of staff over a longer period of time would improve the quality of processing. Analyses showed that most difficulties during occupation data processing resulted from the concept of close matching and from conflicting information. Close matching meant that the words displayed on the computer screen did not have to be exactly the same as the words given in the response. The coders had to consider the meaning of the words given in the response together with the meaning of the words in the display. Conflicting

information provided in census forms resulted in raised queries as the index did not allow the allocation of a code in most cases, for example for 'Managers' and 'Public Servants' classifications. Progressive training concentrating on such issues would benefit coding staff and minimise the workload of Query Resolution staff during actual processing.

6. CONCLUSION

This paper has examined the quality of occupation data from the 1996 Census. The conclusions are outlined below.

- The non-response rate decreased substantially from 5.5 per cent in 1991 to 1.7 per cent in 1996 after changes to form design.

- A new instruction; 'For managers, state main activities managed' was added to the 1996 Census form in an attempt to improve the quality of information provided by respondents. Data analysis shows that in spite of this addition the major group 'Managers and Administrators' recorded the lowest percentage of responses (81.8 per cent) coded to the 4-digit level and the largest dump coding to the 1-digit level (10.9 per cent).

- 'Farmers' contributed largely to the dump coding to the 3-digit level (6.1 per cent) in the major group 'Managers and Administrators'. A new example will be added to the census form to target this group in 2001.

- 'Intermediate Machine Operators nfd' in 1996 and the equivalent classification 'Machine Operators nfd' in 1991 accounted for the largest dump coding to the 2-digit level (10.9 per cent and 17.6 per cent respectively). The improvement might be due to a change of example in the 1996 Census form targeting this classification.

- Coding discrepancies analysis suggests that coders had difficulties differenciating between major groups (1) 'Managers and Administrators', (2) 'Professionals', (3) 'Associate Professionals' and (6) 'Intermediate Clerical, Sales and Service Workers'.

- At the sub-major group level classifications with high discrepancy frequencies were often mistaken for both 'Specialist Managers' (12) and 'Intermediate Sales and Related Workers' (62), and to a lesser extent for 'Managers and Administrators nfd' (10) and 'Intermediate Clerical Workers' (61).

- Classifications with high discrepancy frequencies at the minor group level such as 'Sales and Marketing Managers' (123), 'Shop Managers' (331), 'Miscellaneous Business and Administrative Associate Professionals' (329) and 'Secretaries and Personal Assistants' (511) were often mistaken for both 'Managers and Administrators nfd' (100), and 'Intermediate Sales and Related Workers' (621) or 'General Clerks' (611).

- As seen in the paragraph above the minor group 'Sales and Marketing Managers' (123) was often allocated a code for 'Intermediate Sales and Related Workers' (621) demonstrating how skill levels can be misinterpreted by either respondents or coders. The same applied to the classification 'Shop Managers' (ASCO code 331) which was often mistaken for 'Sales Assistants'(ASCO code 821).

- A major part of coding discrepancies at the unit level fell into two categories: Occupations related to various types of managers and occupations related to various types of clerks. When a manager (usually classified within major groups

(1) or (3)) or a clerk (usually classified within major groups (5) or (6)) was allocated a code within the same major group the severity of the discrepancy was minimal but, as seen before, skill levels are difficult to assess as they stem from respondents' or coders' perception and misallocations between major groups (1) and (6) often occurred.

- The most queried classifications at the unit level were 'Sales Assistants' with 4.7 per cent of queries and 'General Clerks' with 2.9 per cent of queries. The low normalised discrepancy ratio for these classifications indicates that the large number of persons employed in these occupations rather than the difficulty of coding is responsible for the number of queries.

- The data reconciliation between the 1996 Census and August 1996 Labour Force Survey indicated that even though the differences in counts/estimates for both collections were statistically significant, the proportional comparisons for occupation major groups by age and by States showed an overall similarity in the distribution of data.

- Enhancements to census forms, coding procedures and index entries are being tested for the 2001 Census. Progressive training concentrating on coding issues uncovered during 1996 processing could further improve the quality of occupation data.

APPENDIX 1.A : Australian Standard Classification of Occupations (ASCO)

The occupation data in the 1986 and 1991 Censuses were classified according to the Australian Standard Classification of Occupations (ASCO), First Edition. This was replaced with the Australian Standard Classification of Occupations (ASCO), Second Edition for the 1996 Census.

In order to compare the occupation data between the 1996 Census and the 1986 and 1991 Censuses, the Australian Bureau of Statistics had developed a link between the two editions of ASCO. This link was necessary because of structural differences between the ASCO First Edition and ASCO Second Edition. The link was developed by coding responses to questions for occupation to both the First and Second Editions of ASCO, using a specially developed coding index.

1. Conceptual Basis of ASCO

ASCO is a skill-based classification of occupations which covers all jobs in the Australian work force. The concepts of 'job' and 'occupation' are fundamental to an understanding of the classification.

A job is defined as a set of tasks designed to be performed by one individual in return for wage or salary.

An occupation is a set of jobs with similar sets of tasks. Within ASCO, occupations are classified according to two criteria: skill level and skill specialisation.

2. Skill Level and skill specialisation

Skill level is defined as the range and complexity of the set of tasks involved: the greater the range and complexity of the set of tasks, the greater the skill level of the occupation.

In ASCO First Edition, this was measured as the amount of formal education, on-the-job training and previous experience usually necessary for the satisfactory performance of the set of tasks.

The concept of skill level remained unchanged in ASCO Second Edition, but the operational criteria used to measure skill level were refined to reflect competency-based initiatives in employment and training, and to increase the emphasis on entry requirements to an occupation. The criteria used in ASCO Second Edition to measure skill level were the formal education and/or training, and previous experience usually required for entry to an occupation.

The skill specialisation of an occupation is a function of the field of knowledge required, tools and equipment used, materials worked on, and goods or services produced in relation to the tasks performed. In ASCO Second Edition the definition of skill specialisation remained unchanged but included reference to non-production based operations.

3. Differences in Structure between ASCO First and Second Editions

The structure of ASCO Second Edition comprises five hierarchical levels: major group, sub-major group, minor group, unit group and occupation (see Appendix 1.B). This represents a change from ASCO First Edition, where the structure consisted of four levels: major group, minor group, unit group and occupation. The sub-major group level had been added to the structure to enhance users' options for statistical output. Appendix 1.C presents an example of the hierarchy in the second edition from 1-digit to 6-digit classification.

The application of the skill level criteria resulted in changes to the way some occupations were classified in ASCO Second Edition. ASCO First Edition had eight major groups representing eight skill levels. In the second edition each of the nine major groups were assigned to one of five broad skill levels (see Appendix 1.D). Major groups at the same skill level were differentiated from each other on the basis of skill specialisation.

Another major change had been the reorganisation of clerical, sales and service occupations. ASCO First Edition included these occupations in Major Group 5 'Clerks' and Major Group 6 'Sales and Personal Service Workers'. However, in ASCO Second Edition these have been included in three major groups: Major Group 5 'Advanced Clerical and Service Workers', Major Group 6 'Intermediate Clerical, Sales and Service Workers' and Major Group 8 'Elementary Clerical, Sales and Service Workers'. These new groups have different skill levels which better reflect the skill level of the occupations they include.

Additional unit groups had been created to provide more detailed information at the unit group level.

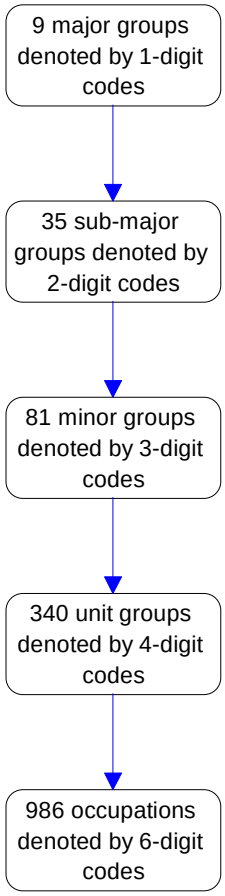
Some other important changes included:

- Managers of small organisations and businesses which did not necessarily have a hierarchy of managers, were classified in Major Group 3 'Associate Professionals' (Skill Level 2), in contrast to the first edition where they were classified in Major Group 1 (Skill Level 1) along with general and specialist manager occupations.
- ASCO First Edition Minor Groups 33 'Air and Sea Transport Technical Workers' and 34 'Registered Nurses', had been moved to Second Edition Major Group 2 'Professionals'.
- ASCO First Edition Unit Group 6603 'Enrolled Nurses' had been moved to Second Edition Minor Group 341 'Enrolled Nurses'.
- Welfare workers had been moved from First Edition Unit Group 3901 'Welfare Para-professionals' to Second Edition, Unit Group 2512 'Welfare and Community Workers'.

Other changes reflected in the ASCO Second Edition structure were the result of the emergence and decline of occupations in the Australian labour market.

APPENDIX 1.B : Structure of ASCO

THE AUSTRALIAN STANDARD CLASSIFICATION OF OCCUPATIONS, SECOND EDITION (ASCO)



APPENDIX 1.C : ASCO, Second Edition - Example of Major, Sub-major, Minor, Unit Groups and Occupations

1 MANAGERS AND ADMINISTRATORS
11 GENERALIST MANAGERS
111 GENERAL MANAGERS AND ADMINISTRATORS
1111 Legislators and Government Appointed Officials
1111-11 Parliamentarian or Councillor
1111-13 Judge
1111-15 Magistrate
1111-17 Tribunal Member
1111-79 Legislators and Government Appointed Officials nec
1112 General Managers
1112-11 General Manager
119 Miscellaneous Generalist Managers
1191 Building and Construction Managers
1191-11 Construction Project Manager
1191-13 Project Builder
1192 Importers, Exporters and Wholesalers
1192-11 Importer or Exporter
1192-13 Wholesaler
1193 Manufacturers
1193-11 Manufacturer
12 SPECIALIST MANAGERS
121 Resource Managers
1211 Finance Managers
1211-11 Finance Manager
1212 Company Secretaries
1212-11 Company Secretary
1213 Human Resource Managers
1213-11 Human Resource Manager
122 Engineering, Distribution and Process Managers
1221 Engineering Managers
1221-11 Engineering Manager
1222 Production Managers
1222-11 Production Manager (Manufacturing)
1222-13 Production Manager (Mining)
1223 Supply and Distribution Managers
1223-11 Supply and Distribution Manager
1224 Information Technology Managers
1224-11 Information Technology Manager
123 Sales and Marketing Managers
1231 Sales and Marketing Managers
1231-11 Sales and Marketing Manager
129 Miscellaneous Specialist Managers
1291 Policy and Planning Managers
1291-11 Policy and Planning Manager

APPENDIX 1.D : ASCO Skill Levels

ASCO FIRST EDITION

MAJOR GROUP	SKILL LEVEL
1 Managers and Administrators	1
2 Professionals	2
3 Para-professionals	3
4 Tradespersons	4
5 Clerks	5
6 Salespersons and Personal Service Workers	6
7 Plant and Machine Operators, and Drivers	7
8 Labourers and Related Workers	8

ASCO SECOND EDITION

MAJOR GROUP	SKILL LEVEL
1 Managers and Administrators	1
2 Professionals	1
3 Associate Professionals	2
4 Tradespersons and Related Workers	3
5 Advanced Clerical and Service Workers	3
6 Intermediate Clerical, Sales and Service Workers	4
7 Intermediate Production and Transport Workers	4
8 Elementary Clerical, Sales and Service Workers	5
9 Labourers and Related Workers	5

APPENDIX 2 : 1991 Census Sequencing of Questions relating to Labour Force Status, Occupation and Industry

Note: a small proportion of employed people incorrectly answered Q31 and were sequenced out of the occupation questions. This problem was probably exacerbated by the page break after Q32.

30 ***Last week*, did the person have a full-time or part-time job of any kind?**

( ) Yes, worked for payment or profit
Now go to 32
( ) Yes, but absent on holidays, on sick leave, on strike or temporarily stood down
Now go to 32
( ) Yes, unpaid work in a family business
Now go to 32
( ) Yes, other unpaid work
( ) No, did not have a job

31 **Did the person actively look for work at any time in the *last 4 weeks*?**

- Actively looking for work means checking or being registered with the Commonwealth Employment Service; writing, telephoning or applying in person to an employer for work; or advertising for work.

( ) No, did not look for work
Now go to 40
( ) Yes, looked for full-time work. **Now go to 40**
( ) Yes, looked for part-time work. **Now go to 40**

32 **In the main job held *last week*, was the person :**

- Mark one box only.
- If the person had more than one job last week then 'main job' refers to the job in which the person usually works the most hours.

( ) A wage or salary earner?
( ) Conducting own business but not employing others?
( ) Conducting own business and employing others?
( ) A helper not receiving wages or salary?

33 **In the main job held *last week*, how many hours did the person work?**

- Subtract any time off, add any overtime or extra time worked.

( ) None
( ) 1-15 hours
( ) 16-24 hours
( ) 25-34 hours
( ) 35-39 hours
( ) 40 hours
( ) 41-48 hours
( ) 49 hours or more

34 **In the main job held last week, what was the person's occupation?**

- Give full title.
- For example, Accounts Clerk, Civil Engineering Draftsman, Fast Foods Cook, Floor Tiler, Extruding Machine Operator.
- For public servants, state official designation as well as occupation.
- For armed services personnel, state rank as well as occupation.

Occupation
.....
.....
.....
.....

35 **What are the main tasks that the person *himself/herself* usually performs in that occupation?**

- Describe as fully as possible.
- For example, recording accounts, preparing drawings for dam construction, cooking hamburgers and chips, fixing cork tiles, operating plastic extruding machine.

Tasks or duties
.....
.....
.....
.....
.....
.....

36 **For the main job held *last week*, what was the employer's trading name?**

- For self-employed persons, print name of business.
- For government employees, print full name of Department and Division, Branch or Section.
- For teachers, print name of school.

Business or trading name
.....
.....

Division, Branch or Section (if any)
.....

37 **For the main job held *last week*, what was the employer's workplace address?**

- For persons with no fixed place of work, provide address of depot or office.

Street no. and name
.....
Suburb or rural locality
.....
City or town
.....
State Postcode
.....

38 **What kind of industry, business or service is carried out *by the employer* at that address?**

- Describe as fully as possible, using two words or more for example, dairy farming, footwear manufacturing.

Industry, business or service of employer of employer
.....
.....
.....

APPENDIX 3 : 1996 Census Occupation and Industry Questions

32 **In the main job held *last week*, what was the person's occupation?**

- Give full title.
- For example, Childcare Aide, Maths Teacher, Pastrycook, Tanning Machine Operator, Apprentice Toolmaker.
- For public servants, state official designation and occupation. For armed services personnel, state rank and occupation.

Occupation

.....

.....

.....

.....

.....

.....

.....

33 **What are the main tasks that the person *himself/herself* usually performs in that occupation?**

- Give full details.
- For example, looking after children at day care centre, teaching secondary school students, making cakes and pastries, operating leather tanning machine, learning to make and repair tools and dies.
- For managers, state main activities managed.

Tasks or duties

.....

.....

.....

.....

.....

.....

.....

.....

34 **For the main job held *last week*, what was the employer's business name?**

- For self-employed persons, print name of business.
- For teachers, print name of school.

Business name

.....

.....

35 **For the main job held *last week*, what was the employer's workplace address?**

- For persons with no fixed place of work, (eg. taxi driver, pilot, courier) write 'no fixed address'.
- This information is used to accurately code the number of people employed in different industries.

Street number and name

.....

Suburb or rural locality

.....

City or town

.....

State/Territory Postcode

.....

36 **What kind of industry, business or service is carried out *by the employer* at that address?**

- Describe as fully as possible, using two words or more for example, dairy farming, footware manufacturing.

Industry, business or service of employer of employer

.....

.....

.....

APPENDIX 4 : Main Coding Procedures for Occupation Data

Occupation Coding Procedures and Rules - Summary

1. Identify the basic word in the occupation title.
2. Enter the first three letters of the basic word and each qualifying word on the title line, basic word first.
3. Select the basic word from the basic word list.
4. Select any qualifying words from the qualifying word list. All words in exact match colour (yellow) must match exactly with words in the respondent's occupation title. (It does not matter if the title contains extraneous words, these can be ignored.)
5. To select an entry containing words displayed in green (or blue), you must find a close match with the task response, or with any remaining unused words in the title response.
6. To select an entry containing words displayed in white, you must find a close match with the task response, with any remaining unused words in the title response, with the employer response, or with the industry response.
7. When the message *RAISE A QUERY FOR THIS RESPONSE* is displayed, it means that a matching index entry cannot be found for the occupation title and you should raise a query.

Matching Rule 1 = Yellow is the exact match colour.

Index entries in yellow can only be selected if all the words in the index entry can be found in the occupation title.

Matching Rule 2 = You should always select the index entry which matches the most qualifying words in the occupation title.

Matching Rule 3 = You have an exact match if the basic word and all the qualifying words in the index entry are found in the title.

Matching Rule 4 = The colour in which the entries are displayed tells you where you can look to find the required information in the occupation response.

If the information is green (or blue), you can look for the information in the task response or in any unused qualifying words in the occupation title.

If the colour is white, you can look for it in the title, task, industry or employer response.
(Note: Do not use industry and employer responses to match with words in the index display unless those words are displayed in white.)

Matching Rule 5 = Green (or blue) and white are close match colours.

Unlike words displayed in yellow, words displayed in green (or blue) or white do not require an exact match with words in the occupation response. They require only a close match.

NAI, Except Above and Proscribed Tasks

8. *NAI* stands for *No Additional Information*.

a) When the *NAI* is displayed in green (or blue) , you can only select the entry when the title and task responses do not contain any information of the type specified in brackets after the letters *NAI*.

b) When the *NAI* is displayed in white, you can only select the entry when the title, task, industry and employer responses also do not contain any information of the type specified in brackets.

9. You should select an *except above* entry when you cannot match the respondents occupation information (title, task and industry) with any other entries in the index list. In cases where there is no additional information in the response, and there is no *NAI* entry, you should select the *except above* entry.

10. Some index entries contain the words *not* or *except*. You can select these entries only if there is no evidence of the excluded information in the relevant responses of the person's occupation. If there is any evidence to suggest that the respondent does any of the tasks that are excluded in the index entry, do not select that index entry.

APPENDIX 5 : The 1996 Quality Management System

5.1 Intakes of Coders in 1996

The census forms were processed in two stages:

- coding of answers marked by respondents; and
- coding of answers written-in by respondents.

Occupation data were processed during the second stage which lasted from the beginning of October 1996 to the end of August 1997. Before January 1997 the process was undertaken by coders who had been specially trained to deal with write-in answers. They were then joined by groups of coders who had finished processing the first stage of the census and who only required minimal training to convert to the more difficult coding. In late March a new group was recruited and trained to compensate for staff losses among the coders.

5.2 The Quality Management System

The strategy for Quality Management (QM) in the 1991 and 1996 Census processing was based on the Total Quality Management philosophy. This philosophy was founded on the belief that errors in the output of a process were primarily the result of deficiencies in the process itself, rather than the actions of individuals working in that process.

The sample rates determined the proportion of each coder's work to be QM processed. During the first few weeks of processing coders were initialized at a start rate when a large number of Collection Districts (CDs) were selected for QM coding. Where a coder had become proficient with procedures and had an acceptable standard of quality, in other words was achieving reasonable discrepancy rates (set to 15 per cent for occupation data) the coder was moved from the start rate to the less intensive base rate. A special rate was used for poor coders so that their work would be selected more regularly than at the start rate. The special rate could also be set below the base rate and was used near the end of a processing deadline for coders who had a high level of competence.

Operations team leaders were responsible for monitoring the discrepancy rates of the coders in the sections they managed. Discrepancy rates by group were computed by the MIS team and placed on the Data Processing Centre Reports database on a weekly basis. Team leaders would receive individual coders' discrepancy rate reports on a regular basis and identify overall progress in the quality of coding. Adjudication feedback was provided to the coders only when procedures had clearly been contravened. Acceptable discrepancy rates were given for each topic. These rates were originally based on performance at earlier census tests but most were decreased for census processing. The occupation discrepancy rate remained set at 10 per cent.

The Quality Management System differed from traditional Quality Control systems in that Collection District batches which exceeded tolerance levels were not reworked except when the discrepancy rate for a particular topic in a CD was over 25 per cent. Then that particular topic was recoded in the whole CD. The benefit of correcting all discrepancies was not justified by the cost or the minor potential gain in quality. For example, if the overall error rate for occupation coding was 10 per cent, and the QM

sample rate for occupation data was 10 per cent, correcting all the discrepancies for occupation data could only reduce the overall error rate to 9 per cent. The actual reduction in the error rate would be further reduced by the effects of errors in the inspection process, and errors introduced during correction.

Coders were encouraged to raise any procedural suggestions or clarifications on case reporting forms. These forms were then passed on to Quality Improvement Teams (QITs) for consideration along with information on discrepancies from the QM system. The QITs would discuss the various reports to identify problems and recommend corrective action. A Quality Management Steering Committee would be consulted on any issues that could not be resolved by the QITs and were responsible for approving any procedural changes recommended by the QITs. When procedures were changed or clarified, an 'All Points Bulletin' (APB) would be circulated to all staff. The aim was to explain procedures which coders found hard to grasp or to relax coding procedures to avoid coders raising too many queries, for example the introduction of basic word equivalents in the system.

Case Reporting Forms, issues raised at QIT meetings and recommendations by Query Resolution coding staff were used to highlight potential index updates. Lists of suggested index updates were sent to Classifications and Data Standards section. Once they were approved, the indexes were updated and copies were forwarded to census processing.

5.3 Limitations of the 1996 Quality Management

Some of the issues to be taken into consideration when interpreting the discrepancy rate are listed below:

- poor coders' work was selected more often for QM reprocessing. Therefore the reported discrepancy rate is higher than the true rate if all batches of Collection Districts had been reworked;
- there is not always an absolute correct code for every response, and procedures can sometimes be open to interpretation. The coder and the adjudicator might both have followed the correct procedures and ended up with a different code;
- where a coder and a QM coder would reach the same coding response, the record would pass through the adjudication process without detection;
- adjudicators and QR staff were just as capable of making incorrect coding decisions as coders;
- all discrepancies identified were given an equal weighting in the Management Information System discrepancy reports. Yet the severity of the discrepancy is important. As an example coding an electrical engineer (code 2125-11) to an electronics engineer (code 2125-13) is a minor discrepancy but coding a tradesperson (major group level 4) to a professional (major group level 2) would be considered a severe discrepancy.

5.4 Sources of Errors in Processing and Resolution

The Quality Improvement teams, which had been set up to identify the root causes of the important quality problems, and to recommend corrective action to address these problems, met regularly. The minutes of the meetings are a reliable source of information for listing some of the factors responsible for discrepancies.

5.4.1 Training

At the first meeting focused on occupation data dated 27/11/96 the QIT pointed out some coding deficiencies which could be attributed to insufficient training. It was brought to attention that many coders were:

- 'coding on task rather than title which leads to different codes.' The QIT thought it 'may have arisen out of problems with Public Service occupations which continually lead to “Disregard title” developing a habit to code from task information';
- avoiding to raise queries because coders 'felt worried' that it would reflect on their ability or because it was time consuming; and
- not using the case reporting forms probably because of the time factor.

The QITs were resolving coding issues as they came to their attention. One of their first corrective directives read:

'If the response is “Public Servant” with no other title, code using “Public Servant”'. Do NOT attempt to convert the task information into another title unless directed to by the system (ie disregard title).'

The QIT recommended that training needed to be presented at a slower rate. They stated: 'This is evident through many coders not having a grasp of various basic concepts and procedures. Ideally, the training should be presented at the level of the slowest person.' Some common coding deficiencies included:

- disregarding the colour coding procedures. For instance the coders would use Q36 about 'type of industry' to complement the information in the forms though there were no options in white on the screen allowing them to do so. An example for this follows:
  Q32: manager
  Q33: managing
  Q36: TAB
  In this case the coder was not allowed to select ‘TAB’ on the screen because the word was displayed in green ('must match closely with the occupation title or task information'). The coder would have to raise a query; or
- using selections on the screen without the appropriate corresponding wording in the census forms, skipping close matches and so on.

5.4.2 Systems and Procedures

It was difficult to foresee all issues and problems until actual data processing started. As with all processing systems the procedural instructions were not firmly established at the beginning of the process but were refined when required. Therefore it was difficult to test the appropriateness of most procedures.

For example the selection of several matches, usually where two occupations were entered in the census forms, caused the system to dump code to the highest code so that fine level information was lost. The problem of multiple listed occupation responses was raised by the QIT in April 1997. The feedback to coders read: 'The processing system will accept only the first two occupations listed. Always use the

responses in the order that they are listed. As a general rule, respondents list the most important occupations in order.' Unfortunately this did not reduce dump coding.

Some of the coders had problems understanding occupation terms and were guessing their meaning. The correct procedure was to consult with section leaders or fill in Case Reporting forms.

The QITs relaxed procedures where needed. Entries were progressively changed from green (must match closely with the occupation title or task information) to white (must match closely with title, task, industry or employer information). Inclusion of basic word equivalents started on 13/3/97 as the analysis of occupation queries had shown that approximately 25 per cent of queries could be resolved with the use of basic word equivalents (for example, 'administrator' was considered equivalent to 'manager').

5.4.3 Index Entries

A major issue was the lack of an appropriate index for recurrent entries. As an example ‘Sales Assistant in a department store’ was not included in the ASCO index. In their first minute dated 27/11/96 the QIT reported:

'The “except above” option under sales was being selected where the respondent worked in a Department or Variety store rather than going through the list of types of sales. It was felt that a general entry for “Department” store and for “Variety” store was needed as “dump” coding was occurring anyway as there was usually not enough information provided to enable a better match than the “except above” option. One way to prevent coders using this as an easy option for coding of sales would be for the selection of “Department” or “Variety” store to lead to a range of more specific types of sales, also including the “except above” or “NAI” (no additional information) option.'

Following these remarks the index was updated on 24/2/97 with twelve department/variety store entries.

5.4.4 Perception of Coders

Respondents could mis-identify their occupations but so could coders. Some of the issues to consider are listed below:

- people have different levels of knowledge. Some coders might mistake job descriptions and select inappropriate entries leading to incorrect codes. For example a supervisor in motor mechanics (ASCO code - 4211-01) might be coded as a mechanical engineer (ASCO code - 2126-11).
- coders might interpret responses differently. For example 'running a shop' could be translated as 'managing' or 'selling';
- judgement is often required. In the previous example additional information extracted from the form could indicate to the coder whether the respondent was in fact a manager or a sales assistant;
- adjudicators could make mistakes. They could classify a correct code as a discrepancy and give misleading feedback to the coder.

APPENDIX 6 : Reconciliation between 1996 Census and August 1996 Labour Force Survey

Table A1 : Adjusted Figures for Occupation Major Groups by Age, Australia, 1996 Census

Occupation major group	*Age group*						
	15-19	*20-24*	*25-34*	*35-44*	*45-54*	*55 and over*	*Total*
Managers and Administrators	4,654	24,158	134,142	210,034	202,504	125,656	701,148
Professionals	9,256	109,041	365,807	410,199	290,864	112,433	1,297,600
Associate Professionals	14,931	76,651	227,160	245,449	201,818	80,908	846,917
Tradespersons and Related Workers	72,616	147,980	273,199	234,680	167,618	80,257	976,350
Advanced Clerical and Service Workers	8,204	36,467	92,155	87,687	74,881	29,934	329,328
Intermediate Clerical, Sales and Service Workers	72,290	197,746	327,734	303,306	229,816	80,827	1,211,719
Intermediate Production and Transport Workers	36,984	66,049	171,961	175,558	142,173	64,841	657,566
Elementary Clerical, Sales and Service Workers	166,968	112,232	126,247	118,802	102,719	49,523	676,491
Labourers and Related Workers	79,777	83,223	148,924	155,434	132,263	66,327	665,948
Inadequately Described	1,560	4,915	16,710	19,399	17,815	10,024	70,423
Total	**467,240**	**858,462**	**1,884,039**	**1,960,548**	**1,562,471**	**700,730**	**7,433,490**

Table A2 : Adjusted Figures for Occupation Major Groups by Age, Australia, August 1996 Labour Force Survey

Occupation major group	*Age group*						
	15-19	*20-24*	*25-34*	*35-44*	*45-54*	*55 and over*	*Total*
Managers and Administrators	1,437	11,536	96,758	176,114	171,470	119,035	576,348
Professionals	7,370	106,564	362,484	413,452	279,733	109,627	1,279,231
Associate Professionals	12,700	69,718	206,839	230,739	200,511	76,820	797,327
Tradespersons and Related Workers	69,247	157,840	297,536	259,389	178,667	81,794	1,044,472
Advanced Clerical and Service Workers	8,553	43,290	97,923	101,111	89,408	34,354	374,638
Intermediate Clerical, Sales and Service Workers	79,123	210,563	352,741	310,356	246,643	88,682	1,288,107
Intermediate Production and Transport Workers	42,455	82,058	184,323	192,384	152,724	73,674	727,619
Elementary Clerical, Sales and Service Workers	204,937	137,027	143,872	145,000	114,508	54,636	799,980
Labourers and Related Workers	121,976	90,080	173,631	173,348	135,447	76,579	771,062
Inadequately Described	NA	NA	NA	NA	NA	NA	NA
Total	**547,798**	**908,676**	**1,916,106**	**2,001,892**	**1,569,110**	**715,201**	**7,658,782**

NA Not Applicable.

Table A3 : Adjusted Figures for Occupation Major Groups by State, Australia, 1996 Census

Occupation major group	*States*							
	NSW	*Vic.*	*Qld*	*SA*	*WA*	*Tas.*	*NT*	*ACT*
Managers and Administrators	233,321	179,450	121,449	59,030	70,707	16,982	5,671	14,538
Professionals	455,317	335,928	208,705	97,741	121,356	29,918	12,728	35,907
Associate Professionals	280,628	213,993	158,482	63,754	85,213	18,894	8,957	16,996
Tradespersons and Related Workers	318,900	242,242	186,526	76,168	106,232	24,774	9,457	12,051
Advanced Clerical and Service Workers	124,073	81,677	55,545	22,230	32,709	5,898	2,685	4,511
Intermediate Clerical, Sales and Service Workers	411,713	289,327	227,034	96,192	119,304	29,585	12,269	26,295
Intermediate Production and Transport Workers	215,123	167,641	126,374	52,581	67,234	17,443	5,321	5,849
Elementary Clerical, Sales and Service Workers	224,434	168,840	132,782	50,460	64,949	16,140	6,055	12,831
Labourers and Related Workers	210,069	156,221	138,012	60,068	69,204	17,388	8,719	6,267
Inadequately Described	23,032	18,868	11,785	4,712	7,035	1,724	931	2,336
Total	**2,496,610**	**1,854,187**	**1,366,694**	**582,936**	**743,943**	**178,746**	**72,793**	**137,581**

Table A4 : Adjusted Figures for Occupation Major Groups by State, Australia, August 1996 Labour Force Survey

Occupation major group	*States*							
	NSW	*Vic.*	*Qld*	*SA*	*WA*	*Tas.*	*NT*	*ACT*
Managers and Administrators	180,209	152,449	105,080	53,867	53,524	11,478	5,525	14,216
Professionals	458,948	327,915	207,070	94,981	118,688	26,907	11,481	33,242
Associate Professionals	260,580	188,485	149,149	66,104	90,619	16,238	10,064	16,088
Tradespersons and Related Workers	334,223	265,189	197,044	80,149	120,757	25,126	9,115	12,869
Advanced Clerical and Service Workers	149,578	88,746	65,219	25,377	34,277	3,926	1,509	6,005
Intermediate Clerical, Sales and Service Workers	416,936	312,368	245,094	109,325	122,977	37,619	14,721	29,067
Intermediate Production and Transport Workers	238,756	197,989	132,950	54,957	68,632	19,913	7,191	7,230
Elementary Clerical, Sales and Service Workers	274,625	194,012	153,334	56,891	80,098	21,071	6,552	13,397
Labourers and Related Workers	239,381	189,729	146,455	68,610	87,234	24,428	8,747	6,477
Inadequately Described	NA	NA	NA	NA	NA	NA	NA	NA
Total	**2,553,236**	**1,916,882**	**1,401,395**	**610,262**	**776,805**	**186,707**	**74,904**	**138,591**

NA Not Applicable.

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If you would like a copy of any of these papers, or have any other queries, please contact Rosa Gibbs on (02) 6252 5942 or Email: rosa.gibbs@abs.gov.au