

Job analysis — time for a paradigm shift

C.J. Cogill

Graduate School of Business Administration, University of the Witwatersrand, Johannesburg

Job analysis, a major form of job measurement, is essential for a whole range of job related personnel functions and is often central in debate and legislation surrounding fair labour practice, equal opportunity and pay. This article deals with the behavioural-science contributions to the field. Job analysis and particularly quantified job analysis is discussed in detail and some methodological issues are highlighted. The author also deals with job design, i.e. the measurement of job content for job-design purposes. Aspects like skill variety, task identity, task significance, autonomy and feedback are scrutinized. Problems and implications regarding validity and reliability are discussed. *S. Afr. J. Bus. Mgmt.* 1984, 15: 220–224

Werksevaluering, 'n belangrike vorm van werksmeting, is baie belangrik vir 'n hele reeks van werksverwante personeelfunksies en is telkens 'n sentrale punt in die debatering en wetgewing in die arbeidspraktiek, gelyke geleenthede en besoldiging. Hierdie artikel benader die bydraes tot die veld vanuit 'n gedragswetenskaplike standpunt. Werksevaluering en spesifieke kwantitatiewe werkevaluering word in detail bespreek en sekere metodologiese geskilders word uitgelig. Die skrywer bespreek verder ook werksontwerp, naamlik die meting van werksinhoud vir werksontwerpdoelstellings. Aspekte soos vaardigheids-variësie, taakidentifisering, taakbeduiding, outonomie en terugvoer word ontleed. Probleme rakende betroubaarheid en geldigheid word bespreek. *S.Afr. Tydskr. Bedryfsk.* 1984, 15: 220–224

S.Afr. Tydskr. Bedryfsk. 1984, 15: 220–224

The role played by job measurement in human resource theory building and practice is emphasized by the fact that most human-resource functions depend on the collection, analysis and interpretation of job-related data. Job analysis, a major form of job measurement, is essential for a whole range of job related personnel functions and is often central in debate and legislation surrounding fair labour practice, equal employment opportunity and equal pay. With the advent of the labour court in South Africa, human-resource managers will undoubtedly be sent back to their drawing boards to examine fundamental practices. They may find, in doing so, that the field of job analysis is itself in need of fundamental reform.

It cannot be contended that insufficient attention has been paid to job analysis and its concomitant measurement aspects. The work of Jones, Hulbert & Haase (1953:173–194); McCormick (1976); McCormick (1979); Morsh (1962); Prien & Ronan (1971:371–396); US Department of Labour (1972); US Department of Labour (1974) testifies adequately to this fact. An examination of the job-analysis field reveals successive phases of development of stronger measurement paradigms. The present paradigms, some 20 years old now, are however, in need of pushing into the next phase of development. Failure to have advanced the state of the art is noted among others by Prien & Ronan (1971:371–396) and Wickert (1980:419–424):

'The next book on job analysis must go out of its way to present a well thought through explication of what remains a messy problem: the pros and cons of various measurement bases. This book is no help at all on this admittedly complex matter.' (p.421)

There are two major sets of contributors to the field of job measurement: Behavioural scientists and industrial engineers (Figure 1).

This paper focuses on the behavioural-science contribution to the field. Within the behavioural-science domain two further subsets of contributors with different, but not unrelated outcomes may be identified — job analysts and job-design theorists (Figure 2).

Job analysis

The major purpose in job analysis is to gather information about jobs. Job analysis may be defined as 'any process of collecting, ordering and evaluating work or worker related information' (US Department of Labour 1974:17).

Job analysis as a process started off purely in a descriptive vein: Essay type description, functional job analysis,

C.J. Cogill

Graduate School of Business Administration,
University of the Witwatersrand, P.O. Box 31170,
Braamfontein, 2017 Republic of South Africa

Accepted September 1984

Dictionary of Occupational Titles (DOT). A detailed account of these descriptive approaches is given by McCormick (1979). Although attempts had been made to quantify certain aspects within these approaches, they never went much beyond allocating percentages to time spent on tasks and the performance of simple analyses on such data.

Quantified job analysis (QJA)

The 1950's however, saw a major advancement in the development of job analysis with attempts to quantify collected data and then to analyse such data by factor-analysis procedures. Three major areas of analysis may be identified; task-oriented QJA, abilities-oriented QJA, and work-oriented QJA.

Task-oriented QJA

In this approach the focus of analysis is on the work activity itself. The mainstream of activity in this domain has emanated from the military with some contribution from civilian

settings; Chalupsky (1962:62–66); Christal (1974); Dunnette & Kirchner (1959:421–429); Krzystofiak, Newman & Anderson (1979:341–357); Miller (1962); Morsh (1964); Saunders (1956); Fleishman (1967:1–10); Lissitz, Mendoza, Huberty & Markos (1979:517–528); Theologus, Romashko & Fleishman (1970); Jaspen (1949:449–459); McCormick, Cunningham & Gordon (1967:417–430); McCormick, Finn & Scheips (1957:358–365); McCormick, Jeanneret & Mecham (1972:347–368). The applications have been mainly in making job-classification decisions. In the past task-oriented analyses have tended to be restricted to specific occupational or technological areas.

Abilities-oriented QJA

In this approach the underlying aptitudes and abilities required to perform the job are the centre of concern. Fleishman (1967) and Theologus, Romashko & Fleishman (1970) identified 37 abilities that have relevance to human task performance and developed scales for use in classifying tasks in terms of such abilities. Lissitz *et al.* (1979) and Mobley & Ramsey (1973:213–225) used 'ability required' in various job classification studies.

Worker-oriented QJA

In this approach the emphasis is on generalized human behaviours required to perform work, for example: 'inspects engine assembly', and 'develops five-year strategic plan'. McCormick, Jeanneret & Mecham (1972:347–368) have been principal contributors to this field in the development of the PAQ. These researchers maintain that in the development of PAQ it has been their intent to incorporate job elements that generally embrace the 'spectrum of human behaviours'.

The general structure of the PAQ given below reflects this aim.

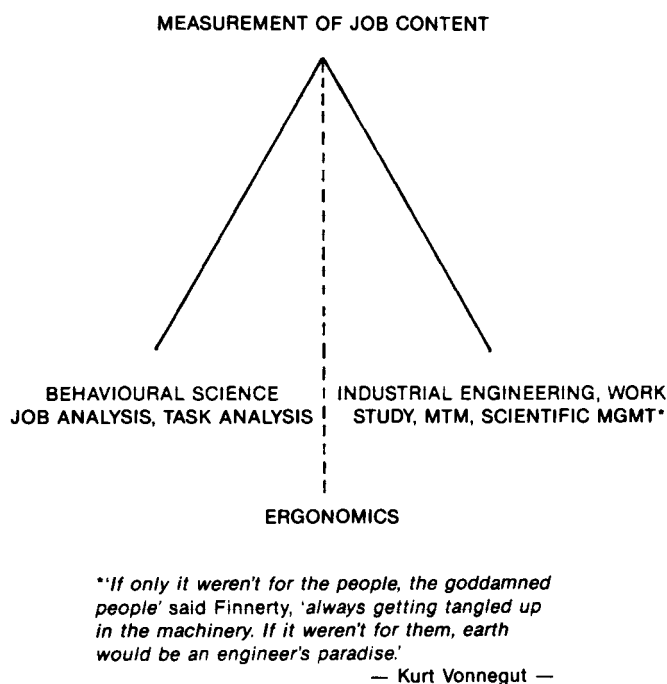


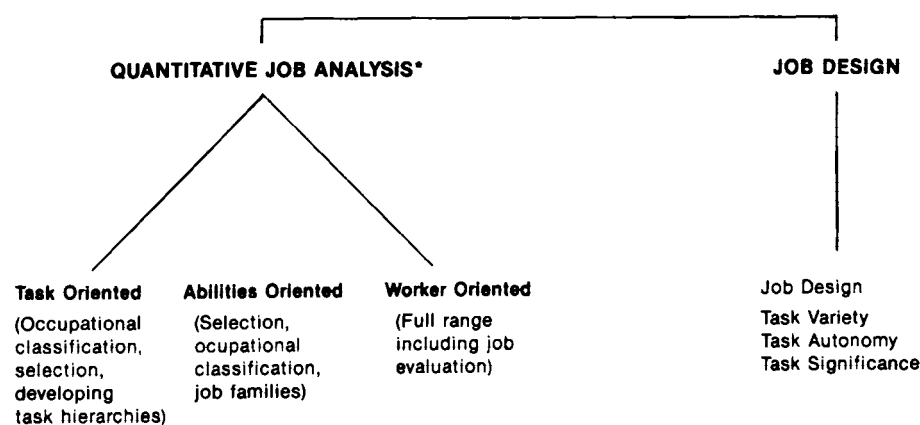
Figure 1 Measurement of job content.

PAQ Form A

Information input
Mediation processes
Work output
Interpersonal activities
Work situation and job context
Miscellaneous aspects

PAQ Form B

Information input
Mental processes
Work output
Relationship with other workers
Job context
Other job characteristics



*This classification would hold for job analysis in general. Highlighting it for QJA, however, emphasises the importance of conceptually keeping these distinctions in mind for the end purpose. The type of data collected can determine the nature of the outcome even when the job analysis model is kept constant.

Figure 2 Behavioural science job measurement.

The PAQ has been utilized in a number of personnel functional areas but primarily with respect to job-classification problems. Worker-oriented variables are more comprehensive than task or abilities-oriented approaches, and can be used to study likenesses and differences in requirements over a whole spectrum of jobs.

Methodological issues

Contributors to this methodological domain include Cornelius, Carron & Collins (1979:693–708) and Cornelius & Lyeness (1980:155–163).

Typically multivariate statistical techniques such as components analysis, factor analysis, cluster analysis, and multi-dimensional scaling have been used to analyse data in QJA. The approaches have been exploratory-descriptive rather than hypothetico-deductive.

Differences in procedure and focus of the measuring instruments in most studies, however, make it very difficult to compare results and obtain cross validation.

The validity of the QJA process and the results obtained are largely unknown. Consistent job information does not necessarily mean it is accurate, comprehensive, and not contaminated. Research on how to estimate the validity of job analysis is difficult, since there is almost no way of showing statistically the extent to which results are accurate portraits of the work. The most promising approach is to examine the extent of convergence among multiple sources (analysts, incumbents, supervisors) and multiple methods. Such multi-method, multi-source research has yet to be conducted and holds promise as a rich field for future research and investigation.

The acceptability of QJA approaches is mixed (Milkovich & Cogill, 1984:10/0–10/14). McCormick (1979), Dunnette (1979) and Krzystofiak *et al.* (1979) all report success in gaining acceptance by the employees and managers involved. However, Gomez-Mejia, Page & Tornow (1979) and Christal (1974) describe experiences in which managers refused to accept the results of QJA. Gomez suggests that the statistical methods used in QJA may be difficult for some managers to understand; consequently, they could not adequately explain the process of results to employees affected by the system.

Finally the efficiency of QJA is relatively unexplored. Krzystofiak *et al.* (1979) report that one application required one year of development and administration of the QJA, at least one personnel professional, and direct costs between \$10 000 and \$20 000 for computing and consulting. Further they counsel that QJA approaches seem most appropriate in moderate to large organizations (over 1 000 employees). The practical utility of QJA, with its relatively complex procedures and analysis remains in doubt for many organizations.

Although QJA has come a long way and is highly promising as a future analytical tool, a considerably higher level of scientific rigour is required. Problems which require attention in the field of QJA are:

- Which subset of the total domain of behaviours/dimensions to include at the outset. 'You can only get out of factor analysis what you put in';
- *a priori* subjective decisions on cut-off points for factor loadings;
- principle components vs. factor analysis vs. latent profile analysis;
- whether to rotate;
- which method of rotation to use; and
- the final interpretation of the factors.

The dimensions derived in most of the studies done to date require more rigorous analysis and definition in terms of both content and construct validity. In a study by Dunnette, Hough & Rosse (1979), for example, dimensions assume a mixture of job titles and processes with two of their dimensions being termed Warehouse Supervision A and Warehouse Supervision B. Are these two locations? Or are they two interpretations? Krzystofiak, Newman & Anderson (1979) obtain 60 job dimensions which lack any coherent internal logic. The dimensions are interpreted in terms of semantics which range from managerial supervision and decision-making (a process or function) through gas: General (chemical:generic quality) to rate (a concept from the laws of motion!).

Past practice has also been beset by problems of small sample sizes for the sophisticated multivariate statistical procedures chosen to handle somewhat soft data only at ordinal level of measurement. Studies have tended to be of a 'one off' nature with no cross validation. Clarity is a further issue. In concluding their article, Dunnette *et al.* (1979) state, with respect to QJA techniques:

'They hold great promise for overcoming many of the conceptually difficult barriers that have so frequently blocked careful and systematic study in the areas of human resource planning and human resource utilization.' (p.51)

However, some typical jargon used in QJA for example, by Tornow & Pinto (1976:410–418), is cast in the following terms:

'Finally hierarchical grouping analysis . . . was applied to cluster analyse the D^2 matrix for identifying homogeneous groupings of positions.' (p.417)

Job design

An area which is traditionally not associated with QJA but which is directly within the domain of behavioural approaches is the measurement of job content for job-design purposes.

The work of Turner & Lawrence (1965), Hackman & Oldham (1976:250–279) and Sims, Szilagyi & Keller (1976:195–212) is central here and has led to the development of the Job Diagnostic Survey (JDS) and Job Characteristics Inventory (JCI). What characterizes this area of research is that the rater is required to consider the job as a whole rather than rate the individual components as is done in most task inventories.

In this area the task characteristics which have been studied in detail include skill variety, task identity, task significance, autonomy, and feedback.

Skill variety

The degree to which jobs require a variety of different activities in carrying out the work, which involve the use of a number of different skills and talents of the employee.

Task identity

The degree to which the job requires completion of a 'whole' and identifiable piece of work, e.g. doing a job from beginning to end with a viable outcome.

Task significance

The degree to which the job has a substantial impact on the lives or work of other people — whether in the immediate organization or in the external environment.

Autonomy

The degree to which the job provides substantial freedom, independence, and discretion of the employee in scheduling the work and in determining the procedures to be used in carrying it out.

Feedback from the job itself

The degree to which carrying out the work activities required by the job results in the employee obtaining direct and clear information about the effectiveness of his or her performance.

Relationships between these task dimensions have been found with measures of motivation, satisfaction, performance, role stress alienation and job involvement among others (Hackman & Oldham, 1975:250–279).

More recently however, the validity of the job-design studies have been questioned by Aldag, Barr & Brief (1981:415–431), and O'Reilly, Parlette and Bloom (1980:118–131), who, among others, have identified the following variables as influencing outcomes of the JDS in particular:

- Informational influence,
- the socially construed nature of jobs,
- role,
- expectation,
- conformity, and
- functional speciality or department.

A fair amount of systematic variance in perceptually measured job characteristics is associated with non-job-centred variables. These findings have led O'Reilly *et al.* (1980) to conclude that one's frame of reference as represented by factors such as past experiences, present roles and socialized expectations, may result in different perceptions and definitions of the same job.

Aldag *et al.* (1981) conclude that both the JDS and the JCI are based on restrictive assumptions concerning task dimensionality.

O'Reilly and Caldwell (1979:157–165) conclude that the influence of the above variables may be reduced if more objectivity measures such as cycle times and the number of operations performed are used.

Aldag *et al.* (1981) suggest that there is a need to examine more fully the issues of task dimensionality and that a 'further measurement strategy that is likely to open new avenues of theorizing is reliance on job analysis data generated by the use of a job (or task) inventory'. (p.428)

Two critical problems are apparent:

- (i) Whether or not task inventories are free from perceptual biases of the kind mentioned by O'Reilly *et al.* (1980) is as yet an unknown factor. Only one study could be found which examined the background of the rater with respect to the JDS (Hakel & Smith, 1979:677).
- (ii) Whether or not task inventories as presently constructed are suitable measurement bases is questionable.

Thus far the only psychometric rationale advanced for their use is the high reliability of the scales (Morsh & Archer, 1967 and Cragun & McCormick, 1967).

McCormick (1979) concedes that reliability of responses does not provide evidence of validity. However, the only 'evidence' for validity which has been advanced is a study by Christal (1969) which reports on the efforts of a group of trainers in the Air Force who refused to accept the validity of occupation survey results in their area, and set about to gather evidence that the data were in error; yet at the end of their investigation, they had to accept the inventory results as being basically valid.

Cornelius & Lyeness (1980) may therefore be somewhat in error on this point when they maintain 'research evidence exists suggesting that incumbents can make reliable and valid ratings of this sort'. (p.155)

One is forced to question the validity of a task inventory where the entire value of a job is determined primarily by time spent, importance, and learning-time dimensions. What about the complexity of the task? One may well ask. The dimension 'learning time' on the other hand is so all-embracing as to include virtually all value aspects associated with job requirements.

An argument put forward for not including further job dimensions is that others that have been considered are more subjective (McCormick, 1979). Do we, however, assume that time spent, importance of a task, and learning time constitute overall construct validity because these are the only dimensions which can be found to be reliable? This is what prominent researchers in the area would appear to have been doing.

Conclusion

The dimensions on present task inventories are either severely limited or so holistic as to describe everything.

The 'frame of reference' factors identified by O'Reilly, *et al.* (1980) must also affect task inventories. However, they advocate the use of task inventories for solving some of the inherent problems in the JDS/JCI.

Task inventories are often limited to specifics and hence lack validity generalization. If they lack validity generalization they will be extremely limited in application to cases concerning fair labour practice, equal employment opportunity and equal pay.

References

- Aldag, R.J., Barr, S.H., & Brief, A.P. 1981. Measurement of perceived task characteristics. *Psychol. Bull.*, vol.90, 415–431.
- Chalupsky, A.B. 1962. Comparative factor analysis of clerical jobs. *J. Appl. Psychol.*, vol.46, 62–66.
- Christal, R.E. 1969. Comments by the Chairman. *Proc. Div. Mil. Psychol. Symp.*, 77th annual convention of the American Psychological Association. USAF, AFSC, AFHRL, Personnel Research Division. Lackland AFB, Texas.
- Christal, R.E. 1974. U.S. Air Force Occupational Research Programs. H.R. Laboratory, AFHRL-TR-73–75.
- Cornelius, E.T., Carron, T.J. & Collins, M.H. 1979. Job analysis models and job classification. *Pers. Psychol.*, vol.32, 693–708.
- Cornelius, E.T. & Lyeness, K.S. 1980. A comparison of holistic and decomposed judgement strategies in job analyses by job incumbents. *J. Appl. Psychol.*, vol.65, 155–163.
- Cragun, J.R. & McCormick, E.J. 1967. Job inventory information: task and scale reliability, and scale interrelationships. PRL-TR-67–15 Lackland AFB, Texas: Personnel Research Lab. Aerospace Medical Division.
- Dunnette, M.D., Hough, L.M. & Rosse, R.L. 1979. Task and Job Taxonomies as a Basis . . . *Hum. Resour. Plann.*, vol.2.
- Dunnette, M.D. & Kirchner, W.K. 1959. A checklist for differentiating different kinds of sales jobs. *Pers. Psychol.*, vol.12, 421–429.
- Fleishman, E.A. 1967. Development of a behaviour taxonomy for describing human tasks: A correlational — experimental approach. *J. Appl. Psychol.*, vol.51, 1–10.
- Gomez-Mejia, L.R., Page, R.C. & Tornow, W. A Comparison of the Practical Utility of Traditional, Statistical and Hybrid Job Evaluation Approaches, Personnel Research Report Nos. 169–79, Control Data Corporation.
- Hackman, J.R. & Oldham, G.R. 1976. Motivation through the design of work: Test of a theory. *Organ. Behav. Hum. Perform.*, vol.16, 250–279.
- Hakel, M.D. & Smith, J.E. 1979. Convergence among data sources, response bias, and reliability and validity of a structured job analysis questionnaire. *Pers. Psychol.*, vol.32, 677.
- Jaspens, N. 1949. A factor study of workers characteristics strength, in-

- telligence, inspection. *J. Appl. Psychol.*, vol.33, 449–459.
- Jones, M.H., Hulbert, S.F. & Haase, R.H. 1953. A survey of the literature on job analysis of technical positions. *Pers. Psychol.*, vol.6, 173–194.
- Krzystofiak, F., Newman & Anderson. 1979. A quantified approach to measurement of job content procedures and payoffs. *Pers. Psychol.*, vol.32, 341–357.
- Lissitz, R.W., Mendoza, J.L., Huberty, C.J. & Markos, V.H. 1979. Some ideas on a methodology for determining job similarities/differences. *Pers. Psychol.*, vol.32, 517–528.
- McCormick, E., Finn, R. & Scheips, C. 1957. Patterns of job requirements. *J. Appl. Psychol.*, vol.41, 358–365.
- McCormick, E.J. 1979. *Job Analysis: Methods and Applications*. New York, Amacom.
- McCormick, E.J. 1976. Job and Task Analysis. In Dunnette (Ed.) *Handbook of Industrial and Organisational Psychology*, III., Chicago: Rand McNally.
- McCormick, E.J., Cunningham, J.W. & Gordon, G.C. 1967. Job dimensions based on factorial analyses of worker oriented job variables. *Pers. Psychol.*, vol.20, 417–430.
- McCormick, E.J., Jeanneret, P.R., & Mecham, R.C. 1972. A study of job characteristics and job dimensions as based on the PAQ. *JAP*, vol.56, 347–368.
- Milkovich, G.T. & Cogill, C.J. 1984. Measurement as an issue in job evaluation. In Rock, M. (Ed.). *Handbook of Salary and Wage Administration*. McGraw Hill, 10/0–10/14.
- Miller, R.B. 1962. Task description and analysis. In R.M. Gagne (Ed.) *Psychological principles in system development*. New York: Holt, Rinehart & Winston.
- Mobley, W.H. & Ramsey, R.S. 1973. Hierarchical clustering on the basis of inter-job similarity as a tool in validity generalisation. *Pers. Psychol.*, vol.26, 213–225.
- Morsh, J.E., and Archer, W.B. 1967. Procedural guide for conducting occupational surveys in the United States Air Force. Lackland Airforce Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, PRL-TR-67–11. September 1967.
- Morsh, J.E. 1962. *Job analysis bibliography*. USAF PRL tech. document. Report No. 62-2 (IV), PRL-TDR-62 2.
- Morsh, J.E. 1964. Job analysis in the United States Airforce. *Pers. Psychol.*, vol.17, 7–17.
- O'Reilly, C., & Caldwell, D. 1979. Informational influence as a determinant of task characteristics and job satisfaction. *JAP*, vol.64, 157–165.
- O'Reilly, C.A., Parlette, G.H., & Bloom, J.R. 1980. Perceptual measures of task characteristics: The biasing effects of differing frames of references and job attitudes. *Acad. Manage. J.*, vol.23, 118–131.
- Prien, E.P. & Ronan, W.W. 1971. Job analysis: a review of research findings. *Pers. Psychol.*, vol.24, 371–396.
- Saunders, D.R. 1956. Objective description and classification of engineering jobs II. Factor analysis of the Bay group data form. Educational Testing Service, Princeton, New Jersey.
- Sims, H.P., Szilagyi, A.D. & Keller, R.T. 1976. The measurement of job characteristics. *Acad. Manage. J.*, vol.19, 195–212.
- Theologus, G.C., Romashko, T. & Fleishman, E.A. 1970. Development of a taxonomy of human performance: A feasibility study of ability dimensions for classifying human tasks. Washington, D.C. American Institutes for Research, AIR-7 26 1/70 1 TR 1 5.
- Tornow, W. & Pinto, P. 1976. The development of a managerial job taxonomy. *JAP*, vol.61, 410–418.
- Turner, A. & Lawrence, P. 1965. *Industrial jobs and the worker*. Cambridge, Mass: Harvard University Press.
- Wickert, F.R. 1980. Job analysis — methods and applications — McCormick, E.J. *Pers. Psychol.*, vol.33, 419–424.
- U.S. Department of Labour Job Analysis for Human Resources Management: a review of Selected R & D. Manpower Research Monograph, No 36, Washington, D.C. Govt. Printing Office, 1974.
- U.S. Department of Labour Handbook for Analysing Jobs. Washington, D.C., Govt. Printing Office, 1972.