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BUSINESS INFORMATION SYSTEMS

The University of the Witwatersrand

Measuring the Effectiveness of Human Resource Information Systems in the Financial Services Sector

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TERMINOLOGY

The terms Data Processing (DP), Management Information Systems (MIS) and Information Systems (IS) have been replaced by the latter day terminology, Information Technology (IT).

CHAPTER 1

INTRODUCTION AND BACKGROUND

Firms have classically been described as consisting of men, money, methods and materials. With the re-engineering of organisations in the South African market over the past few years, the importance of the employee to the employer organisation is under renewed investigation. Personnel departments are under increasing pressure from senior management to answer queries regarding the functioning, placement and performance of the human resources of the organisation. Factors such as the effectiveness of employee performance and affirmative action have forced companies to upgrade the information systems available to their personnel departments. The reporting requirements of government policy and short implementation time has led most major companies to acquire a (HR) Human Resource information systems package to perform the required tasks. As these HR information systems become a critical success factor for personnel departments and for the functioning of the organisation as a whole, finding a method to measure the effectiveness of these acquired HR systems has assumed greater importance. The critical questions that organisations often ask are:

- *Are the acquired HR systems performing to expectation?*
- *How does the performance of the organisation's particular HR system compare to other HR systems used by other organisations in the same market sector?*
- *Is the organisation getting value for the money spent on HR systems?*

Although a wealth of research has been undertaken into the effectiveness of financial and manufacturing systems in SA, no equivalent research exists on the effectiveness of HR systems. Remenyi, Money and Twite, (1993) postulate

> *"that in evaluating the success or effectiveness of the IT Department it is necessary to evaluate the success or effectiveness of the individual systems".*

Using this postulate as a starting point, the effectiveness of HR systems in the SA Financial Services Sector was researched.

CHAPTER 2
LITERATURE REVIEW

Section 2.1: A Literature review of effectiveness studies in the information systems area

Section 2.1.1 Alternative approaches to effectiveness studies

Early effectiveness studies concentrated on a number of diverse factors to try to establi' a universal effectivity measure. Factors that were used to measure effectiveness include:

- incremental performance in decision making effectiveness (King and Rodriquez, 1978),
- cost-benefit analysis (King and Schrems, 1978),
- information economics (Maish, 1979),
- utility analysis (Kleijnen, 1980),
- the analytic hierarchy approach (Nigam and Hong, 1981),
- information attribute examination (Epstein and King, 1982)

Ein-Dor and Segev (1978) surveyed most of the scientific, professional and trade reports on the construction and use of IT systems. They identified 50 items of an empirical nature that could affect the success of IT, which they regarded as the dependant variable of their study. An interesting finding was that user expectation and preconceptions played a predominant role in establishing the psychological climate towards a system in an organisation. They postulated that the attitudes and preconceptions of IT are determined by the quality of the systems in use. Bailey and Pearson (1983), in trying to establish the usage of IT systems found that perceived user satisfaction to be an important measurement factor. They defined productivity in IT services as

"both supplied and effectively utilised IT outputs."

Ginsberg (1978) argued that if one viewed the system as a service that enables managers to perform more effectively, the advocated system usage measure would be a misleading indicator of success. In later research, Ginsberg (1981) proposed a user perceived effectiveness approach. Ives et.al.(1983), suggested that system usage and user perceived effectiveness be used. Srinivasan (1985) found that an understanding the relationship between the various specific dimensions of perceived effectiveness and commonly accepted behaviourial measures would lead to a better understanding of effectiveness. Srinivasan (1985) suggested effectiveness be measured by taking account of user needs. In a study by Miller and Doyle (1987) found that IT effectiveness could be expressed as a function of the relationship between perceived importance and performance of individual IT systems attributes as rated by the user of the IT system.

Section 2.1.2 A definition of effectiveness

"An effective information system is one which achieves the purposes of its users"

This definition of effectiveness proposed by Miller (1989) reflects the state of the art on IT effectiveness at this point in time. This definition of effectiveness was based on the decision matrix shown in figure 2.1.1:

		IT	CAPABILITY
		PRESENT	ABSENT
BUSINESS	PRESENT	FIT	NO FIT
NEEDS	ABSENT	NO FIT	FIT

Figure 2.1.1 Miller's decision matrix of business needs and IT performance.

Miller (1989) postulated that the decision matrix shows that if a business has a business need for an IT system and the IT department has the capacity to deliver the required system, a fit condition exists. In contrast, if a business does not have a business need for an IT system and the IT department has the capacity to deliver the required system, a no fit condition exists. A similar argument would apply to the no fit condition when the IT department's cannot deliver a system that is needed by the business. The remaining fit condition exists, if there is no business need for a IT system and the IT department does not have the capacity to deliver the system. The existence of the fit-fit and no fit - no fit definitions paves the way for the use of linear correlations and regression analysis in effectiveness surveys. A positive linear correlation coefficient would indicate a fit - fit condition, while a negative linear correlation coefficient would indicate a no fit - no fit condition. To measure effectiveness using Miller's (1990) effectiveness definition a comparison between user expectations and IT performance would need to be undertaken.

Section 2.1.3 Measurement of effectiveness

Miller and Doyle (1987) developed and validated an instrument to measure IT effectiveness, this instrument was based on the research of Martin (1982), Bailey and Pearson (1983) and Alloway and Quillard (1981) respectively. The Miller and Doyle instrument is designed to measure the perceived effectiveness of the overall IT function and involves the use of a questionnaire. The questionnaire comprises five parts labelled Part A through Part E. Part A consists of 34 questions which measure the extent to which certain facets of the IT are perceived to be important in ensuring the business's IT will be effective and successful. The attitudes are rated on a semantic differential scale of 1 (irrelevant) to 7 (very critical).

Part B consists of four questions on future needs of IT. Part C consists of the same 34 questions as Part A but in this case the 34 questions measure the actual performance achieved by certain facets of the IT. The same 7 point scale from 1 (irrelevant) to 7 (excellent) is used. Part D consists of four questions relating to the organisation's performance in developing new systems. Part E consists of four questions which capture certain demographic data. One of the four questions of Part E asks for a rating of the organisation's overall IT performance on a scale of 1 (complete failure) to 7 (very successful). The importance ratings of Part A and B capture perceptions of business needs, while Parts C and D capture perceptions of the IT capability. A factor analysis of the 38 performance ratings revealed that there were seven dimensions (factors) underlying the responses to these 38 questions. The factors are:

- Characteristics of conventional systems
- Responsiveness to new systems needs
- Reliability of service
- IS staff quality
- User involvement
- End user computing
- Strategic management

The Miller and Doyle (1987) factors were based on the seven critical success factors (CSFs) identified by earlier by Martin (1982), namely:

- Data Processing Operations
- Systems Development
- Human Resource Development
- Relationships with the Management of the Parent Organisation
- Support of the Objectives and Priorities of the Parent Organisation
- Management of Change (Technological)
- Management Control of the IT Organisation

The Martin CSF's were mapped from the four critical success factors identified by Rockart (1982) namely:

- Service
- Communication
- Human Resources
- Repositioning the IT function

These 3 mappings provide an excellent example of the incremental progress and development of an instrument, based on previous research, to measure the effectiveness of factors affecting the IT function. The relevant mappings are illustrated in Figure 2.1.2

The purpose of the Miller and Doyle instrument was to provide a measure of fit of between the overall effectiveness of IT as a function of the correlation between the user's perceived importance and performance of the individual IT attributes in a post implementation phase. These IT attributes were grouped into the 7 independent factors as shown in figure 2.1.2. The composition and actual content of the Miller and Doyle instrument are described in more detail in Chapter 4.

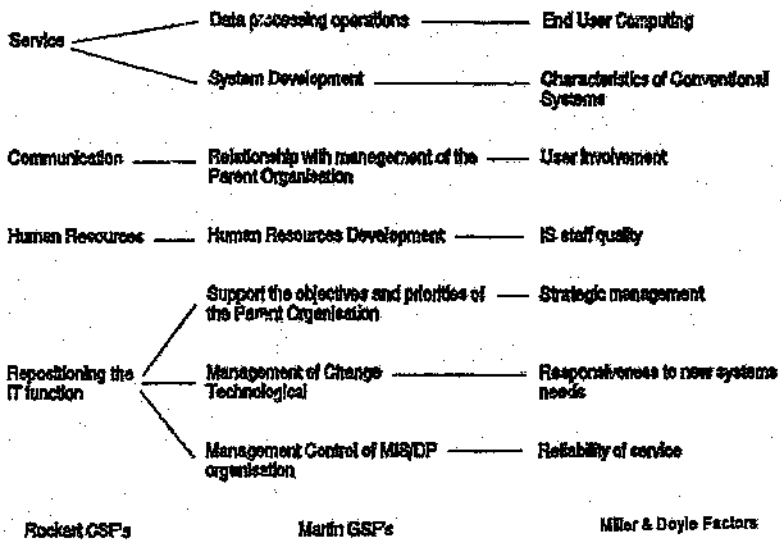


Fig 2.1.2: Development of the Miller and Doyle instrument

Section 2.1.4 The link between other effectiveness research and Miller's research

One of the more recent developments in the measurement of effectiveness is the concept of User Information Satisfaction (UIS). In this regard, Remenyi et.al.(1993) states

> "*that UIS is generally considered to result from a comparison of user expectations (or needs) of the IT with the perceived performance (or capabilities) of the IT on a number of facets of the IT*".

UIS is measured by magnitude of the gap between the user's expectation score of the IT performance and the user's expectation score of the IT. Kim's (1990) conceptual model shown in figure 2.1.3 is used to explain how the UIS is derived. Kim's model has 3 gaps, namely, Gap 1, Gap 2 and Gap 3. These gaps have been interpreted as:

- Gap 1 The discrepancy between the user expectations of IT and the systems designer's interpretations of these expectations

- Gap 2 The discrepancy between the IT specialist's interpretation of the user's needs and the quality of what is actually installed for the user

- Gap 3 The discrepancy between what is actually installed for the user and what the user experiences when interacting with the system

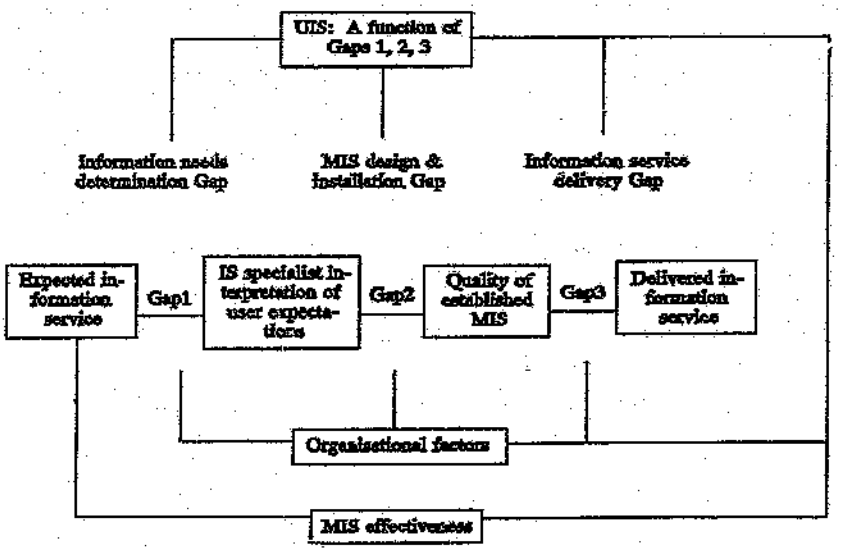


Figure 2.1.3: Kim's conceptual model of UIS.

The gaps referred to in Kim's (1990) model can be easily determined from the factors identified by the Miller and Doyle's (1987) instrument. These gaps can then be used to provide different insights into the effectiveness of IT systems. In further research, Miller (1989) postulated that:

> *"Fit occurs if there is a perceived business need for a particular IT capability and that capability is believed to be present. Conversely if no need is perceived and the capability is absent, there is also fit. An unfulfilled need implies lack of fit (gap), as does the presence of an unwanted capability".*

Using this definition he developed an IT Systems Behaviourial Model that took account of the gap identified by Kim (1990). The proposed fit (gap) model proposed is shown in figure 2.1.4, and is based on IT systems behaviour.

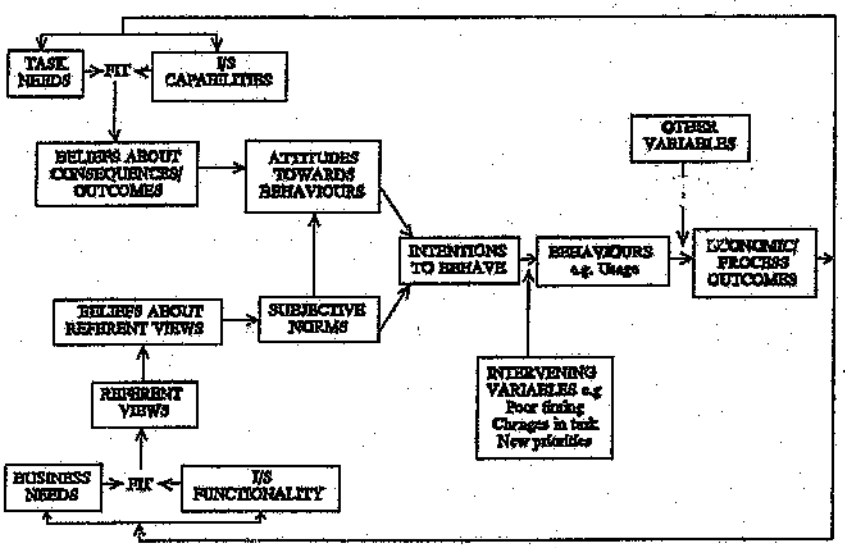


Figure 2.1.4: Miller's model of IT Systems Behaviours

Figure 2.1.4 shows that there are economic outcomes as a result of a 'fit' between either IT capability and task needs and/or IT functionality and business needs. For purposes of this research, economic outcomes will be defined as the initial purchase cost of the relevant HR package. It can be argued that these economic outcomes could either be measured at a individual or study level or at a global level. For purposes of this research the economic outcomes will be measured at a global level.

Section 2.1.5 The link between effectiveness studies, marketing and Miller's behaviourial theory

Remenyi et.al.(1993) states that

> *"a feature of Kim's model is that UIS is considered to be influenced not only by the post implementation experience of IT but also by the pre-implementation expectations of the IT".*

Sanders (1984) identified four factors that appear to influence effectiveness, these are pre-implementation factors, user expectations, IT and individual systems performance functions.

Szajna and Scamell (1993) researched the interaction between the four factors identified by Sanders(1984), using cognitive dissonance theory (Festinger, 1957) as a theoretical basis. The research addresses the association between user expectations and two measures of IT success, user perceptions and user performance. This measurement of expectation to performance would place the research done squarely in the field of effectiveness studies.

Using their approach Szajna and Scamell (1993) found that

> *"it is also important to consider the perceptions of the users for the IT in much the same way that marketing professionals study both the performance of a product and the consumers perceptions of the product's performance".*

Marketing literature on consumer expectations is particularly relevant to the study of IT user expectations because an IT system can be viewed as a product or service provided to the IT user (consumer) by the IT department (Cash et.al.(1988); McLoed et.al.(1982); Schewe et.al.(1977)). Lucas et.al.(1980) developed a simplified dynamic marketing model of consumer behaviour, which explains the consumers behaviour when faced with a decision of choice. In much the same way Miller's behaviourial model of IT systems behaviour explains the IT user's behaviour when faced with a decision of choice. From the above arguments there appears to be the striking similarities with regard to concepts (expectation and performance), definitions (IT user and consumer) and measurement criteria (fit or gap) in marketing and IT effectiveness literature. This research report will endeavour to use these similarities in determining the effectiveness of HR systems in the Financial Services Sector of the SA market.

Section 2.2: The significance of the human resource systems investment in the South African market.

The South African market is serviced by several HR packages. This figure excludes in-house developed systems. A name list of the relevant packages are AccSys, Cullinet, Educos, HurQles, ITS, JACE, Oracle Personnel, PE Chris Junior, Paywise, PersonnelEase, Peodesy, PeopleSoft, Profile, Peterborough, RP System and Third Foundation. These packages run all sizes of computers from mainframe computers to Personal Computers (PC's).

From research performed by Freeme (1993):

- The estimated number of installed individual packages is 3200.
- The installed investment capital in HR packages is estimated at R 54 million, with an annual maintenance fee of around R 8.1 million.

Using 5 years as useful life of a computer system as well as a 5 year write-off period for software purchases yields a 5 year cost of R 94.5 million to South African businesses for HR systems.

Section 2.3: Research Objectives

The objectives of this research is to determine:

- the importance of HR systems to the Financial Services Sector
- perceived effectiveness of HR systems in terms of performance and expectations.
- a reliable method that can be used to measure the use of effectiveness studies in making IT management decisions.

The meet these objectives the following hypothesis are postulated:

Hypothesis 1	HR systems presently have a more important role in organisations in South Africa than in previous years.
Hypothesis 2	Perceived effectiveness of HR systems is a consequent of the subjective performance and expectations of the survey respondent.
Hypothesis 3	Applying marketing concepts to effectiveness studies should result in the improved IT management decisions.

CHAPTER 3
RESEARCH METHODOLOGY

Section 3.1: Data Collection Strategy

The questionnaire survey method of collection was chosen as it provided the most common method whereby marketing information could be assimilated on the effectiveness of HR systems in South Africa. As it would have been too costly and time-consuming to perform a complete survey of the effectiveness of systems in South Africa, it was decided to sample the financial sector of the market. The financial sector was chosen as the information regarding postal addresses was readily available and the fact that most financial sector companies would probably use human resources systems. Two groups of researchers Bailey and Pearson (1983) and Alloway and Quillard (1981) developed instruments to measure user information satisfaction. Miller and Doyle (1987) used twenty four items from Bailey and Pearson (1983), twelve items from Alloway and Quillard (1981) and two additional items to design their composite instrument. Two Scales of performance and importance are measured for each item on a semantic differential scale of 1 (irrelevant) to 7 (very critical). Another factor why the Miller and Doyle (1987) questionnaire was chosen to perform the study was that it had been validated in previous research. Data was collected regarding the seven factors in respect of HR systems characteristics of conventional systems. These factors were responsiveness to new systems needs, reliability of service, IS staff quality, user involvement, end user computing and strategic management. The questionnaire was directed to the personnel officers of the chosen sample as they would probably be the principal users of an HR system.

Section 3.2: The Research Methodology

The 1987 Miller and Doyle instrument was chosen as it had been used extensively in many different firms, in many different sectors, and the results provide convincing evidence of the instrument's reliability and validity. Remenyi, et.al. (1993) found that

> *"the Miller and Doyle instrument provided a validated and refined instrument to measure information systems effectiveness".*

The 1987 Miller and Doyle instrument, shown in Appendix A, was used in its original form with the exception of question 80 that was replaced by a question to determine the importance of the role of the HR systems in use by organisations in the financial sector of the South African market. The questionnaire comprises five parts labelled Part A through Part E. The questionnaire contains 80 questions numbered from 1 to 80. Part A through Part B contain questions numbered from 1 to 38 to measure the expectations with regard to HR systems. Part C through Part D contains questions numbered 39 to 76 to measure performance of HR systems. Part E contains questions 77 and 78 to provide information about the respondent, while question 79 provides for the overall impression of the effectiveness of HR systems used by the organisation. Question 80 was added to determine the importance of the role of the HR systems. The questionnaire assessed each question on a 7 point scale. The scale categories range from 1 (Very Poor) to 7 (Excellent). A question was added to determine the perceived importance of the role of HR systems within the research population. The Personnel Manager's of 50 firms in the financial services sector, as listed in the MacGregors Financial Database were invited to participate in the study. The firms included banks, insurance companies and financial services companies. Fifty questionnaires were posted to the respective firms. 18 completed questionnaires were returned. The response characteristics are shown in figure 3.2.1.

Firm Grouping	Number	Respondents	Management Level
Banks	18	5	Upper 1 3
Life Assurance	14	9	2 4
Financial Services	18	4	Middle 3 4
			4 5
			Lower 5 2
Totals	50	18	18

Figure 3.2.1 Survey Response Characteristics

A respondent rate of 36% was attained with the postal instrument. The overall figure of 18 firms compares favourably with the 21 firms of the 1987 Miller and Doyle study, however the individual respondent rate was of the order of 276 in the later study compared to 18 of this study. The replies to the instrument questions are shown in Appendix B.

Seven factors were identified by the 1987 Miller and Doyle instrument. Figure 3.2.2 shows the grouping of the relevant question numbers contained in the instrument to the relevant factor. For analysis purposes these grouping are referred to as factor 1 through to factor 7 as shown in figure 3.2.2.

Factor Number	Factor Name	Question number
1	Functioning of existing systems	1, 4, 11, 18, 26, 30, 35, 36
2	Linkage to strategic processes of the firm	7, 8, 19, 28, 32, 33, 34
3	Amount of user involvement	3, 17, 21, 22, 27
4	Responsiveness to new systems needs	5, 9, 12, 14, 23, 29
5	Responsiveness to end user computing needs	10, 16, 37, 38
6	IT Staff Quality	2, 15, 20, 24, 31
7	Reliability of services	6, 13, 25

Figure 3.2.2 Question Factors Linkage.

The 7 factors were split into two analysis sets. In the first analysis set the mean of expectation and performance are identified by the factor followed by an e or p suffix respectively. In the second analysis set the gap, determined by the difference between the mean expectation and the mean performance, for each factor was used in the analysis. Statistical analysis was performed on each of the analysis sets using two statistical packages, MYSTAT Statistical Applications (Hale, 1992) and Computerized Business Statistics (Hall, 1994).

The 18 responses were analyzed to determine the minimum, maximum, range, mean, variance, standard deviation, standard error and sum of each factor grouping of questions in each analysis set. The overall means, mean of gaps and totals of performance and expectation of the sample were calculated.

Pearson and multiple regression analysis was performed to establish whether the measured performance and expectation factors could individually or could be combined to predict the overall effectiveness of HR systems.

In contrast to the Miller & Doyle study (1978) no significant statistical correlation could be found between performance or expectation and the gap of the study. Different researchers have interpreted the existence of the gap between expectation and performance differently. This lack of a formal methodology to interpret the gap into meaningful management decisions, prompted further research into the economic/process outcomes segment of the Miller's model (shown in figure 2.1.4) of IT systems behaviour.

The research into the economic/process segment of Miller's model (shown in figure 2.1.4) of IT systems behaviour lead to research into the origins of effectiveness studies and questionnaires in the marketing discipline and how these could be used in combination with the existing processes of Miller's model to produce decision information from this effectiveness study.

This in turn led to the development of a adapted IT system behaviour model for this research study into the effectiveness of HR systems in the Financial Services Sector.

Using the adapted model the gap between expectation and performance was analyzed with the aid of snake and radar charts with meaningful results. Finally, a methodology is offered for the use of effectiveness studies by management and IT departments of organisations.

CHAPTER 4
PRESENTATION AND ANALYSIS OF RESULTS

Hypothesis 1 HR systems presently have a more important role in organisations in South Africa than in previous years.

The hypothesis could have been rejected had any one of respondents returned a negative answer to the question in Part E of the questionnaire

"Do you rate feel that Human Resources Information Systems play a more active role in your organisation than in previous years: Yes...No."

However, the hypothesis could not be rejected as all the respondents answered positively to the question.

Hypothesis 2 Perceived effectiveness of HR systems is a consequent of the subjective performances and expectations of survey respondents.

The 18 responses were analyzed using Miller's methodology. The minimum, maximum, range, mean, variance, standard deviation, standard error, and sum were determined for each analysis set. The means of each factor grouping of questions and the overall means and totals of performance and expectation of the sample was calculated. The result of this analysis (shown in Appendix C) shows that HR systems perform consistently below expectation for all 7 factors. The mean of the first analysis set shows clearly that the expectation exceeds the performance by roughly 1 scale point. The mean of the performance analysis set shows that factor 1 has the smallest gap, while factor 3 has the largest gap. A summary table of the second analysis set is shown in Figure 4.1.

FACTOR	EXPECTATION	PERFORMANCE	GAP
Factor 1	5.65	5.22	0.43
Factor 2	5.16	4.28	0.88
Factor 3	5.64	4.58	1.07
Factor 4	5.69	4.49	1.19
Factor 5	5.44	4.69	0.75
Factor 6	.54	4.46	1.09
Factor 7	3.74	5.26	1.51
Total	36.89	32.97	0.56
Mean	5.27	4.71	0.56

Figure 4.1 Summary table of the means of expectation, performance and the resultant gap.

SA is a geographic diverse country. Communication and transport facilities range from first to third world. SA HR package supplier's are quite small companies with minimal development and support staff. These HR package suppliers normally operate from the cities of Johannesburg and Cape Town, while HR package users are distributed throughout South Africa. It stands to reason that support by these HR package suppliers to the installed HR package users is minimal. Freeme (1993) found that the largest HR package supplier with an installed base of 600 packages had 4 support staff for their package. Figure 4.1 shows that reliability of service (Factor 7) has the largest gap, this appears to be an accurate reflection of the package suppliers support to HR package users.

The SA job market is in a state of transition. Companies are under pressure from central government to implement affirmative action manpower policies within their companies. This pressure to change mainly affects the HR departments and consequently the installed HR systems. With minimal support and development staff available from the HR package suppliers responsiveness to new systems needs is virtually non-existent. Figure 4.1 shows that reliability of service (Factor 4) has the second largest gap, this appears to be an accurate reflection of the SA HR package market.

A surprise finding of the study was that IT staff quality had the third largest gap. SA IT staff are normally highly rated in surveys. If this factor is viewed in conjunction with the following 3 rated factors, amount of user involvement, linkage to strategic processes of the firm and responsiveness to end user computing needs, the gap probably indicates that the installed HR packages are not keeping pace with the rapidly changing HR market.

Pearson and multiple regression analysis was performed to establish whether the measured performance and expectation factors could be combined to predict the overall effectiveness of HR systems.

> "*Traditionally, the Pearson correlation has been used to indicate the degree of association between two quantitative variables*" (Hale, 1992).

The Pearson correlation matrix for the two analysis sets are shown in Appendix D. To be significant the correlation coefficients must exceed 0.40 or -0.40 at a 95% confidence level and 0.543 or -0.543 at a 99% confidence level for 18 observations. The first analysis set yielded a probable correlation between the factors shown in figure 4.2.

Factor1E (conventional systems expectation) and Factor3E (user involvement expectation).
Factor1P (conventional systems performance), Factor2P (strategic management issues performance), Factor4P (responsiveness to new systems needs performance), Factor5P (end user computing performance) and Factor6P (IS quality performance).
Factor2E (strategic management issues expectation), Factor5E (end user computing expectation).
Factor2P (strategic management issues performance) and Factor6P (IS staff quality performance).
Factor3E (user involvement performance) and Factor7E (reliability of service expectation).
Factor3P (user involvement performance), Factor4P (responsiveness to new systems needs performance) and Factor6P (IS staff quality performance).
Factor4E (responsiveness to new systems needs expectation) and Factor6E (IS staff quality expectation).
Factor4P (responsiveness to new systems needs performance), Factor5P (end user computing performance), Factor6P (IS staff quality performance).
Factor6E (IS staff quality expectation) and Factor6P (IS staff quality performance).

Figure 4.2 Possible correlations between factors of the first analysis set.

The second analysis set yielded a probable correlation between the factors shown in figure 4.3.

Factor1 (conventional systems performance), Factor2 (strategic management), Factor 3(user involvement), Factor 4(responsiveness to new systems needs), Factor 5(end use computing), Factor6 (IS staff quality) and the gap (expectation - performance).
Factor2 (strategic management), Factor7 (reliability of service) and the gap (expectation - performance).
factor3 (user involvement), Factor4 (responsivenessto new systems needs), Factor 6 (IS staff quality), Factor7 (reliability of service) and the gap (expectation - performance).
Factor4 (responsiveness to new systems needs), Factor5 (end user consulting performance) and the gap (expectation - performance).
Factor5 (end user computing) and the gap (expectation - performance).
Factor6 (IS staff quality) and the gap (expectation - performance).

Figure 4.3 Possible correlations between factors of the second analysis set.

No confirmation correlation of these Pearson correlations could be established when using multiple regression analysis.

Correlation analysis was done using the mean combined expected scores of factor1 through factor7 to predict HR systems effectiveness. The results of the multiple regression is shown in Appendix D.

For this survey, the mean effectiveness scores were found to significantly predict the effectiveness of HR systems scores ($R = .615$, $F = 0.869$, $df = 7,10$, $p < .0005$). The generated regression equation for:

HR score = 11.981 - 0.186Factor1E - 0.595Factor2E - 0.738Factor3E + 0.300Factor4E + 0.207Factor5E - 0.485Factor6E - 0.296Factor7E

Correlation analysis was done using the mean combined performance scores of factor1 through factor7 to predict HR systems effectiveness. The results of the multiple regression is shown in Appendix D. For this survey, the mean effectiveness scores were found to significantly predict the effectiveness of HR systems scores ($R = .700$, $F = 1.369$, $df = 7,10$, $p < .0005$). The generated regression equation for:

HR score = 11.981 - 0.150Factor1P + 0.984Factor2P - 0.984Factor3P + 0.660Factor4P - 0.236Factor5P - 0.0.071Factor6P - 0.416Factor7P

To place confidence intervals around the expected HR system score, the standard error of estimate (0.94) can be used.

Correlation analysis was done using the mean combined performance scores of factor 1 through factor 7 to predict HR systems effectiveness. The results of the multiple regression is shown in Appendix D. For this survey, the mean effectiveness scores were found to significantly predict the effectiveness of human resources systems scores ($R = .700$, $F = 1.369$, $df = 7,10$, $p < .0005$). The generated regression equation for:

HR score = 4.676 - 0.150Factor1P + 0.051Factor2PE - 0.984Factor3P + 0.660Factor4P + 0.236Factor5P - 0.071Factor6P - 0.416Factor7P

To place confidence intervals around the expected HR system score, the standard error of estimate (0.85) can be used.

No significant correlation could be found to predict the HR system scores when using the gap derived from the mean of expectation less the mean of performance.

The outcome of these statistical tests would suggest that Hypothesis 2 cannot be rejected.

Hypothesis 3 Applying marketing concepts to effectiveness studies should result in improved IT management decisions.

From a marketing point of view the users of HR systems in South Africa are in fact consumers. Lucas et.al. (1989) explains consumer behaviour by way of the dynamic marketing model shown in figure 4.4.

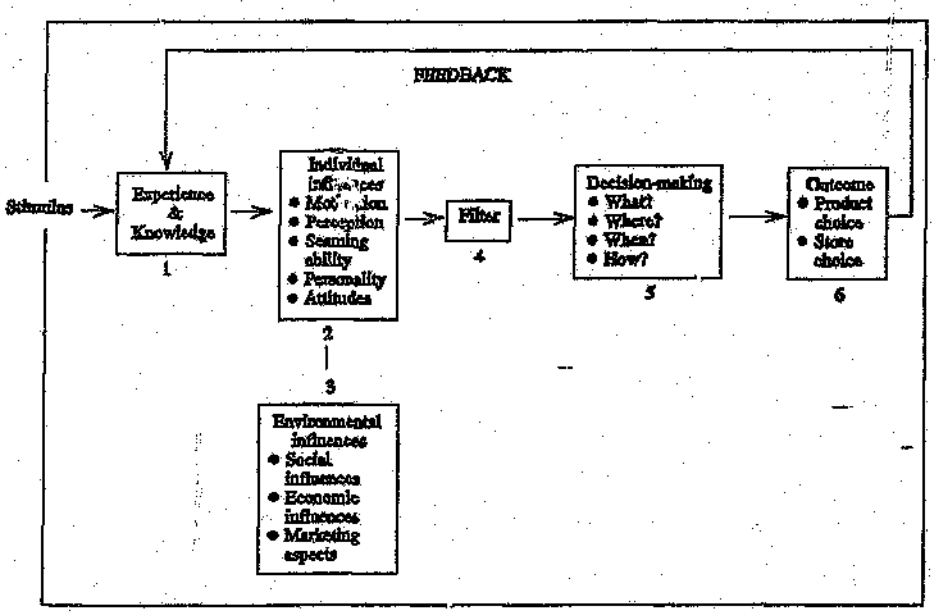


Figure 4.4 The dynamic marketing model.

In developing a dynamic model, problems evolve. All the influencing factors act simultaneously so that it is difficult, even impossible, to say which of these factors have the initial or greatest impact on consumer decision-making. Furthermore, consumers are not all the same, for some the social influences are of overriding importance when faced with the choice between alternative products, while others may regard it as less important.

Figure 4.4 constitutes a simplified dynamic model of consumer behaviour. The sequence of influence is indicated by arrowed lines.

Figure 4.4 is discussed with reference to the numbers 1 to 7 as indicated in the model.

1. An **unsatisfied need** stimulates the individual to react and leads to behaviour.

2 & 3. The **knowledge** and **experience** of the consumer as well as other **individual factors** refer to internal inputs which influence decision-making.

4. **Social, economic** and **marketing influences** from the environment refer to external sources of influence. The figure shows interaction between individual and environmental influences. All these inputs which eventually direct and determine the outcome and the behaviour pattern flow together into the "filter".

5. In the "**filter**" incoming information is interpreted in a subjective manner and weighed according to the values and preconceptions of the individual. This implies that the information, which forms the basis of consumer decisions, is in fact not the objective reality but a distortion to fit individual values and preconceptions. The existence of this "filter" complicates the communication process because the receiver

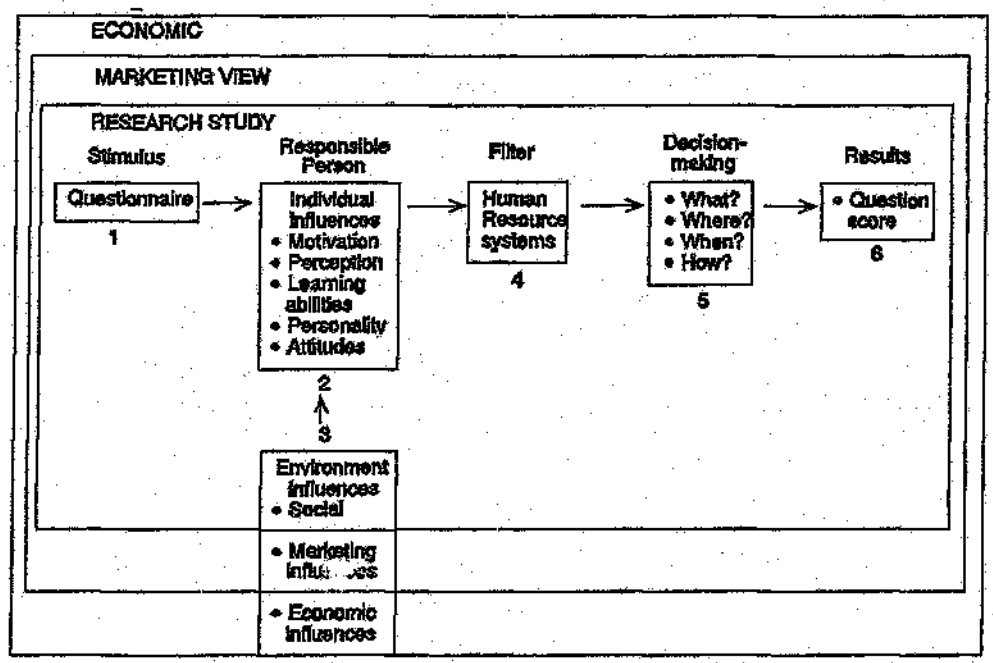
does not always interpret the information as intended by the communicator.

6. **Decision-making** entails the choice between what must be bought, where it should be bought, when and how action should take place. The figure shows that internal (2 and 3) and external (4) factors determine these decisions.

7. The **outcome** indicates the specific choice of product and/or store.

8. **Feedback** indicates that the satisfaction (or dissatisfaction) concerning the outcome contributes to the knowledge and experience (2) of the individual and can be regarded as an input when another, similar decision must be taken.

Applying the dynamic marketing model to this study leads to the adapted dynamic marketing model as shown in figure 4.5. This research study was conducted in the Financial Services Sector of the SA market consequently the economic influences (outer block of figure 4.5) provide the encompassing environment for the study. The economic, marketing and social environments influences the expectations of an HR package. The economic and social environment influences the performance of the HR package.



- Figure 4.5 Adapted dynamic marketing model.

Discussing figure 4.5 with reference to the numbers 1 to 6 as indicated in the model.

1. The **questionnaire** simulates the responsible person to react and leads to behaviour;

2. The **knowledge** and **experience** of the responsible person as well as other **individual factors** which influence decision-making;

3. **Social, economic and marketing** influences from the environment. The figure shows the interaction between individual and environmental influences. All these inputs eventually direct and determine the outcome and behaviour pattern that flow together into the filter;

4. The **filter** "the human resource system" is interpreted in a subjective manner and weighted according to the values, expectations and preconceptions of the responsible person;

5. **Decision-making** entails the choice between a **rating score** of 1 (very poor) through 7 (excellent); and

6. The **result** indicates the specific rating score assigned to a question.

To enable a holistic view of this research study figure 4.6 was developed. Figure 4.6 portrays that this research study is based on a questionnaire comprising individual questions. The questionnaire is completed by the person responsible for the HR system. The outcome of the completed questionnaire for this research study are measures of performance, expectation and the gap between performance and expectation in respect of HR systems effectiveness. If these completed questionnaires are collected together they represent the opinion of the Financial Services Market segment in respect of the effectiveness of HR packages. The Financial Services market segment is a sample of the total SA HR systems market. The total HR systems market demand was calculated to be R 94.5 million (section 2.2).

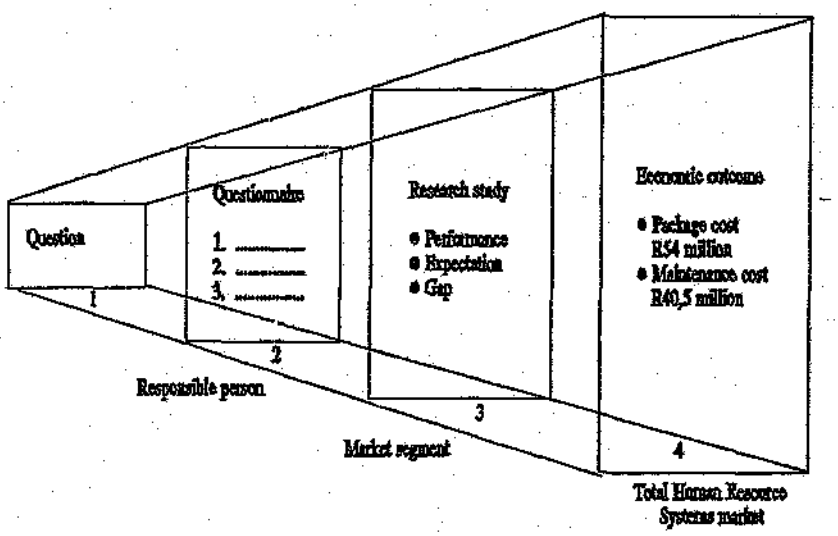


Figure 4.6: Holistic survey marketing view.

Figure 4.6 is discussed with reference to the numbers 1 to 4 indicated in figure 4.6.

1. Represents each **question** of the **questionnaire.** Each question provides a subjective view of a responsible person in respect of the expectations or performance of an HR system operating in a particular organisation;

2. The questions are combined into **individual questionnaires** that represent the **total subjective opinion** of a **responsible person.** The individual expectation and performance opinions are combined and synthesised into a single opinion about the overall performance of a particular HR system. This opinion is exercised in question 79 of the questionnaire;

3. All the completed questionnaires represent a **market segment** of the **total HR systems** market in South Africa;

4. Represents the **total HR systems demand market.**

Market research concentrates on two aspects, namely **needs** and **benefits.** Needs and benefits form an integral part of Goodhue's (1989) model of information systems satisfactoriness.

These concepts were synergised into Miller's behaviourial model by including:

1. Expected benefits to in the beliefs about consequences/outcomes and behaviour process; and

2. Total market concept into the economic/process outcomes.

To enable to use the concepts and findings, of the adapted dynamic marketing model (figure 4.5) and the holistic view of this research study (figure 4.6), one needs to incorporate them in an accepted body of theory. Miller's model (figure 2.1.4) provides the ideal vehicle for this incorporation. The adapted model of IT Systems Behaviour is shown in figure 4.7.

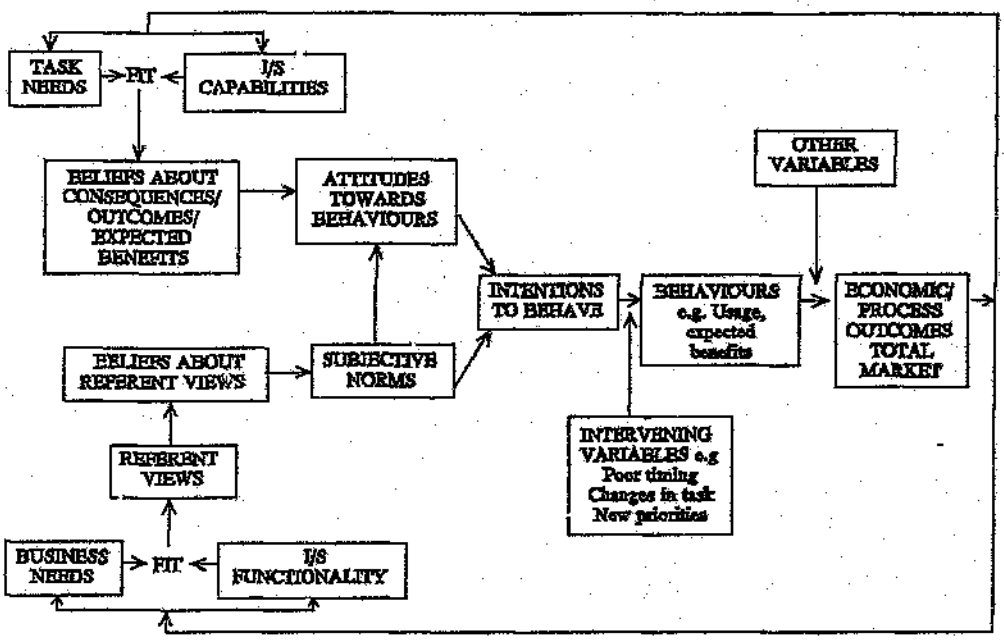


Figure 4.7: Adapted Miller's model of IT Systems Behaviours

The marketing concepts of market demand and market potential can be accommodated within this adapted model. Market demand can be accommodated via process outcomes to performance, while market potential can be accommodated via expected benefits to expectation. These relationships allow a decision maker to make economic based decisions on the findings of effectiveness studies. To illustrate this finding the following a snake diagram of the results of the expectation, performance and the resultant gap of the HR systems survey is presented in figure 4.8. Figure 4.8 on its own does not provide further insight into the effectiveness of HR systems, neither does it supply meaningful information on which to base management decisions

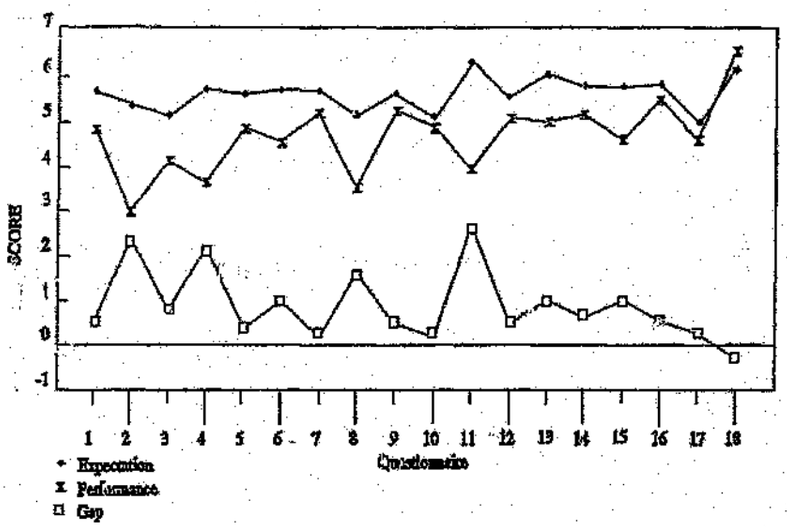


Figure 4.8: Snake diagram of expectation, performance and the resultant gap

In contrast, if these same results are plotted on a wheel diagram with the concepts of market demand and market potential equated to demand and expectation, as shown in figure 4.9, meaningful management decision can be made.

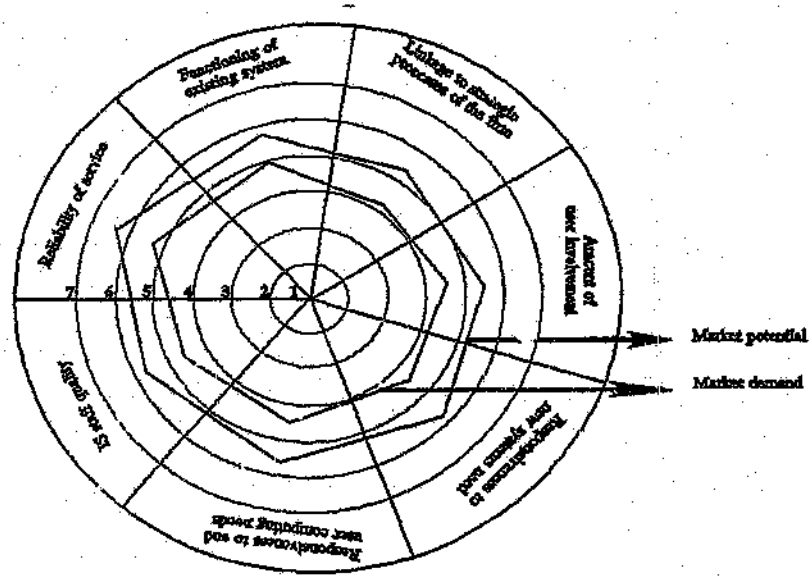


Figure 4.9 Wheel diagram of HR systems effectiveness based on marketing concepts.

The total performance of HR systems effectiveness score over the 7 factors totalled to 32.97. The cost of producing this level of effectiveness was R 94.5 million over a 5 year period (being the capital cost of R 54 million plus a maintenance fee of R 8.1 per year multiplied by 5 years period). By dividing the R 94.5 million by the 32.97 (total performance effectiveness) results in each point of performance effectiveness costing R 2.8 million. The total gap between expectation and performance would now represent the market potential for improvement of effectiveness.

The total gap in this study would represent a cost of approximately R 18 million, ie it will cost businesses with HR systems packages, an additional R 3.6 million per year over a 5 year to bring the performance of HR systems up to the expectation wanted by survey respondents. Similarly the R 18 million market potential can now be interpolated into the 7 survey factors. The tangible cost associated with bringing each of the performance factors up to expectation is shown in figure 4.10.

Factor	Expectation	Performance	Gap	Cost millions
Factor 1	5.65	5.22	0.43	R 1,20
Factor 2	5.16	4.28	0.88	R 2,47
Factor 3	5.64	4.58	1.07	R 3,00
Factor4	5.69	4.49	1.19	R 3,33
Factor 5	5.44	4.69	0.75	R 2,10
Factor 6	5.54	4.46	1.09	R 3,05
Factor 7	6.24	5.26	0.98	R 2,74
Total	39.36	32.97	6.39	R 17,89
Mean	5.27	4.71	0.54	

Figure 4.10 Cost of bringing performance up to expectation.

From the table in figure 4.10 management questions could be asked, for example using the result of Factor 1

"are the organisation's prepared to pay R 1,2 million to get the performance of the existing HR system up to expectation ?"

Continuing this line of reasoning SA HR package suppliers could decide on the following question as a result of Factor 4:

" Are we willing R 3.33 million to incorporate new systems needs into our HR package ?"

Similarly a training facility might use the result of Factor 6 by asking the question:

"There appears to be a lucrative market of about R 3 million in the training of IT staff in the use of HR packages. Do we want to get involved in this kind of training ?"

The answers to these kind of questions will lead to meaningful management decision making.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

Using a validated instrument such as the Miller and Doyle instrument for effectiveness studies allows the researcher to concentrate on the results, instead of whether the correct questions had been asked for a particular aspect.

The HR systems implemented in the Financial Services Sector are not performing to expectation on the seven factors surveyed in this research. This finding is confirmed by the relatively low mean score achieved by the performance attribute of the survey. The research also found that there is an opportunity cost of R 18 million , as shown in figure 4.10, to improve the performance of packaged HR systems supplied to the Financial Services Sector. Coupled to the view that the Financial Services Sector is often seen as the forerunner in the implementation of computerised systems and the research finding that HR systems are playing a prominent role in this sector there appears to be an excellent marketing opportunity for a flexible HR packages that can easily tailored to meet client organisations expectations.

Although meaningful statistical correlations were obtained between the HR score and the performance and expectation factors surveyed, the lack of correlation between the gap and HR score did not allow the researcher to make any inferences as to the meaning of the gap.

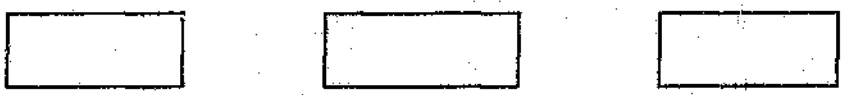
The marketing discipline provided an excellent vehicle to consolidate the research findings and provide possible solutions to the questions raised by the survey. Using the link between the marketing, the research study and the IT Systems Behaviour Model of Miller an adapted IT Systems Behaviour Model was developed.

Using this adapted model it was possible to derive valuable market decision information with regard to HR packages in SA.

From these research findings it is recommended:

1. That instead of trying correlate independent variables with dependant variables that direct questions regarding the variables being measured be asked.For instance the following questions on the functioning of existing systems could be included in the questionnaire:

   "If your present rating of the functioning of existing systems (Factor1) is found to be below expectation. What amount of money are you prepared to spend to bring performance up to expectation."

   Hundreds Thousands Millions

   The answer to this question would indicate in monetary terms what the users of a particular system feel the gap between performance and expectation is worth. If accurate costing information is available on what has been spent on the particular system meaningful comparisons, decisions and discussions can take place to decide whether or not to proceed with remedial actions. The answers to this kind of question would lead to meaningful management decision making.

2. That further research into the use of combined effectiveness and marketing studies be performed on other sectors of the South African market to confirm the findings of this study.

The overall finding of this research was that meaningful IT and management decisions could be made by employing effectiveness studies linked to the marketing concepts of demand and potential.

The benefit of this research is that it has identified that:

- HR systems are playing an important information systems role in the Financial Services Sector

- that most of the installed HR systems are not performing to expectation

- that it will cost organisations a fair amount of money to bring the installed HR systems performance up to expectation

- that meaningful IT and management decisions could be made by using the effectiveness study measures of expectation and performance linked to the marketing concepts of demand and potential.

In conclusion effectiveness studies can be used to provide IT and general management with excellent decision-making information if the study is linked to marketing concepts.

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Appendix A

Miller and Doyle Survey Instrument

Survey of Computer-Based Information Systems

PART A.

The Importance of Different Attributes of the Organization's Human Resource Information System

Please consider the following attributes of a computer-based information system. Evaluate how IMPORTANT you feel that each attribute is in ensuring that the overall system will be effective and successful within your organization. Below is reproduced a scale from 1 to 7 with each number representing a degree of importance. Using the descriptions provided on this scale, circle the number you feel most represents your evaluation of the importance of each of the attributes (1 to 34) listed on the following pages.

Irrelevant — Possibly Useful — Important — Very Critical

1 2 3 4 5 6 7

NOTE: An information system is defined as a set of computer-based procedures which, when executed, provide information to support decision-making and control in the organization. The abbreviation IS has been used throughout the questionnaire.

Irrelevant — Possibly Useful — Important — Very Critical

1 2 3 4 5 6 7

1.	Availability and timeliness of report delivery to users.	1	2	3	4	5	6	7
2.	Quality and competence of systems analysts employed by IS department.	1	2	3	4	5	6	7
3.	Communications between IS staff and managerial users.	1	2	3	4	5	6	7
4.	Volume of output information provided by the system.	1	2	3	4	5	6	7
5.	Prompt processing of requests for changes to existing systems.	1	2	3	4	5	6	7
6.	Efficient running of current systems (costs, ease of use, documentation, maintenance).	1	2	3	4	5	6	7
7.	Use of a steering committee for developing and monitoring the information system.	1	2	3	4	5	6	7
8.	IS department profitability (from chargeouts for services as a profit centre).	1	2	3	4	5	6	7
9.	IS support for users in preparing proposals for new systems.	1	2	3	4	5	6	7
10.	Ease of access for users to computer facilities for terminals.	1	2	3	4	5	6	7

11.	Currency (up-to-dateness) of output information.	1	2	3	4	5	6	7
12.	Short lead time required for new systems development.	1	2	3	4	5	6	7
13.	A low percentage of hardware and software downtime.	1	2	3	4	5	6	7
14.	The improving of new systems development (with respect to time, cost, quality, disruptions).	1	2	3	4	5	6	7
15.	High degree of technical competence of staff of the IS department.	1	2	3	4	5	6	7
16.	Effective training program for users in general IS capabilities.	1	2	3	4	5	6	7
17.	User confidence in systems.	1	2	3	4	5	6	7
18.	Accuracy of output information.	1	2	3	4	5	6	7
19.	Preparation of a strategic plan for developing IS.	1	2	3	4	5	6	7
20.	User-orientated systems analysts who KNOW user operations.	1	2	3	4	5	6	7
21.	The degree of personal control.	1	2	3	4	5	6	7
22.	User's feeling of participation.	1	2	3	4	5	6	7
23.	Flexibility of data and reports available from system.	1	2	3	4	5	6	7
24.	Positive attitude of IS personnel towards users.	1	2	3	4	5	6	7
25.	Data security and privacy.	1	2	3	4	5	6	7
26.	Completeness of output information.	1	2	3	4	5	6	7
27.	User's understanding of systems.	1	2	3	4	5	6	7
28.	Setting of systems priorities to reflect overall organisational objectives.	1	2	3	4	5	6	7
29.	Systems responsiveness to changing user needs.	1	2	3	4	5	6	7
30.	Relevance of report contents (to intended function).	1	2	3	4	5	6	7
31.	Increasing the proportion of IS department's effort expended in creating new systems.	1	2	3	4	5	6	7
32.	Application of modern database technology.	1	2	3	4	5	6	7
33.	Top management involvement in defining and monitoring IS policies.	1	2	3	4	5	6	7
34.	Overall cost-effectiveness of information systems.	1	2	3	4	5	6	7

PART B.

Future Needs for Information Systems

Monitor, Exception, Inquiry and Analysis Systems are described as follows:

Monitor: The system monitors daily detail activity producing standard reports and FIXED SCHEDULE (daily,weekly or monthly), for example, personnel at work on a daily basis.

Exception: The system processes daily detail but produces EXCEPTION reports where the definition of EXCEPTION CONDITIONS ARE FIXED, for example, only produces a report if a certain condition occurs.

Inquiry: The system provides a database with FLEXIBLE inquiry capability, enabling MANAGERS to design and change their own monitoring and exception reports.

Analysis: The system provides powerful DATA ANALYSIS capabilities (modelling, optimisation, or statistical routines) and appropriate database support to MANAGERIAL decision makers.

Irrelevant		Possibly Useful		Important			Very Critical
1	2	3	4	5	6	7	

35.	Development of more monitor systems	1	2	3	4	5	6	7
36.	Development of more exception systems.	1	2	3	4	5	6	7
37	Development of more analysis systems	1	2	3	4	5	6	7
38.	Development of more inquiry systems.	1	2	3	4	5	6	7

PART C.

Actual Performance Achieved by the Organisation

Now please consider the same attributes as in Part A and evaluate the degree of PERFORMANCE attained within YOUR organisation. A scale of 1 to 7 is reproduced below, each number representing a level of performance. Please evaluate each attribute on the basis of this scale, and circle the number the appropriate number on the following pages.

Irrelevant — Possibly Useful — Important — Very Critical

1 2 3 4 5 6 7

39.	Availability and timeliness of report delivery to users.	1	2	3	4	5	6	7
40.	Quality and competence of systems analysts employed by IS department.	1	2	3	4	5	6	7
41.	Communications between IS staff and managerial users.	1	2	3	4	5	6	7
42.	Volume of output information provided by the system.	1	2	3	4	5	6	7
43.	Prompt processing of requests for changes to existing systems.	1	2	3	4	5	6	7
44.	Efficient running of current systems (costs, ease of use, documentation, maintenance).	1	2	3	4	5	6	7
45.	Use of a steering committee for developing and monitoring the information system.	1	2	3	4	5	6	7
46.	IS department profitability (from chargeouts for services as a profit centre).	1	2	3	4	5	6	7
47.	IS support for users in preparing proposals for new systems.	1	2	3	4	5	6	7
48.	Ease of access for users to computer facilities for terminals.	1	2	3	4	5	6	7
49.	Currency (up-to-dateness) of output information.	1	2	3	4	5	6	7
50.	Short lead time required for new systems development.	1	2	3	4	5	6	7
51.	A low percentage of hardware and software downtime.	1	2	3	4	5	6	7
52.	The improving of new systems development (with respect to time, cost, quality, disruptions).	1	2	3	4	5	6	7
53.	High degree of technical competence of staff of the IS department.	1	2	3	4	5	6	7
54.	Effective training program for users in general IS capabilities.	1	2	3	4	5	6	7

55.	User confidence in systems.	1	2	3	4	5	6	7
56.	Accuracy of output information.	1	2	3	4	5	6	7
57.	Preparation of a strategic plan for developing IS.	1	2	3	4	5	6	7
58.	User-orientated systems analysts who KNOW user operations.	1	2	3	4	5	6	7
59.	The degree of personal control.	1	2	3	4	5	6	7
60.	User's feeling of participation.	1	2	3	4	5	6	7
61.	Flexibility of data and reports available from system.	1	2	3	4	5	6	7
62.	Positive attitude of IS personnel towards users.	1	2	3	4	5	6	7
63.	Data security and privacy.	1	2	3	4	5	6	7
64.	Completeness of output information.	1	2	3	4	5	6	7
65.	User's understanding of systems.	1	2	3	4	5	6	7
66.	Setting of systems priorities to reflect overall organisational objectives.	1	2	3	4	5	6	7
67.	Systems responsiveness to changing user needs.	1	2	3	4	5	6	7
68.	Relevance of report contents (to intended function).	1	2	3	4	5	6	7
69.	Increasing the proportion of IS department's effort expended in creating new systems.	1	2	3	4	5	6	7
70.	Application of modern database technology.	1	2	3	4	5	6	7
71.	Top management involvement in defining and monitoring IS policies.	1	2	3	4	5	6	7
72.	Overall cost-effectiveness of information systems.	1	2	3	4	5	6	7

PART D.

Organisational Performance in Developing New Systems

Monitor, Exception, Inquiry and Analysis Systems are described as follows:

Monitor: The system monitors daily detail activity producing standard reports and FIXED SCHEDULE (daily,weekly or monthly), for example, personnel at work on a daily basis.

Exception: The system processes daily detail but produces EXCEPTION reports where the definition of EXCEPTION CONDITIONS ARE FIXED, for example, only produces a report if a certain condition occurs.

Inquiry: The system provides a database with FLEXIBLE inquiry capability, enabling MANAGERS to design and change their own monitoring and exception reports.

Analysis: The system provides powerful DATA ANALYSIS capabilities (modelling, optimisation, or statistical routines) and appropriate database support to MANAGERIAL decision makers.

Now please consider the following and determine how well your organisation has PERFORMED in the following areas.

Irrelevant		Possibly Useful		Important		Very Critical
1	2	3	4	5	6	7

73.	Development of more monitor systems	1	2	3	4	5	6	7
74.	Development of more exception systems.	1	2	3	4	5	6	7
75	Development of more analysis systems	1	2	3	4	5	6	7
76.	Development of more inquiry systems.	1	2	3	4	5	6	7

PART E.
Demographic Data

Would you kindly answer these additional questions. Please circle the relevant number.

77. What is your age?

1. 30 and below

2. 31 to 40

3. 41 and over

78. Which of the following best describes your position in the management structure of you organisation ?

1. Upper

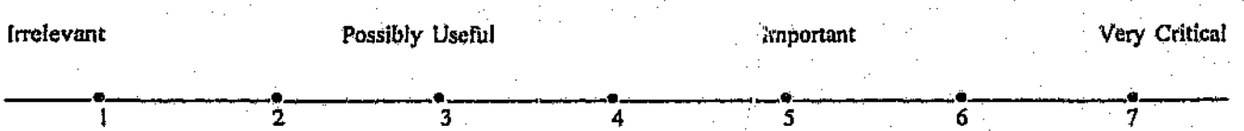
2. Upper Middle

3. Middle

4. Lower Middle

5. Lower

79. How would you rate your organisation's overall Human Resources Information System, given the following scale ?



80. Do YOU feel that Human Resource Information Systems play a more active role in your organisation than in previous years?

1. Yes

2. No

Thank you for your time, it is greatly appreciated.

D M Freeme
PO Box 1797
Randburg
2125
25 May 1995

Dear Sir/Madam

Survey on the effectiveness of your Human Resource Information System

I am currently undertaking a survey on the effectiveness of Human Resource Information Systems used in the Financial Services Sector of the South African market. The survey forms part of a research project towards an MCom degree at the University of the Witwatersrand. I hope to identify the factors that encourage successful organisations to use Human Resource Information Systems. The results of this project will be published in a scientific journal that will be coordinated by the Department of Commerce of the university.

I would be grateful, if you would complete the attached questionnaire on your particular Human Resource Information System. The questionnaire should take only 10 minutes to complete, and can be posted back to me in the envelope provided.

The information you provide will be treated in the strictest confidence and your company name will not be used under any circumstance.

Should you require any further information, I can be contacted telephonically, during office hours, at Pretoria: 012-3133100.

Thank you for your time

Yours sincerely

David M Freeme

Appendix B

Respondent Replies

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
01	6	5	6	3	5	4	5	4	5	6	7	4	5	6	6	5	7	7	6	5	5	6	7	5	7	6	5	7	6	7	4	5	5	6	4	4	7	7
	6	4	5	5	4	5	5	5	5	6	5	4	5	4	4	5	4	5	6	5	5	4	4	6	7	5	4	6	4	6	4	3	6	5	6	6	4	4	3	2	6	1
02	4	1	5	3	7	6	5	1	1	4	7	6	7	5	6	4	5	7	4	7	6	7	7	7	6	6	5	6	6	7	4	5	5	5	4	5	5	7
	4	1	1	5	1	4	3	1	1	4	4	3	4	4	1	1	4	5	1	1	4	4	3	1	5	4	4	3	3	4	1	5	6	3	2	2	4	4	2	3	5	1
03	6	6	5	4	6	5	5	4	5	5	6	5	5	5	5	5	5	6	5	5	5	5	5	6	7	5	5	5	4	5	4	5	5	6	3	3	4	3
	5	6	5	5	5	5	5	1	4	5	3	3	5	4	6	5	7	5	4	4	4	4	2	6	7	4	5	4	4	5	3	4	2	3	2	2	1	1	1	4	5	1
04	6	3	2	5	6	6	6	2	6	3	5	6	6	6	6	6	7	7	7	7	6	6	7	7	7	7	7	5	7	7	7	7	4	6	5	6	6	6
	4	3	2	4	1	5	6	2	4	5	4	2	3	3	3	4	4	5	5	4	3	3	3	2	6	6	4	3	2	4	3	6	7	5	5	5	1	3	2	2	6	1
05	5	6	5	5	6	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	5	5	6	5	6	6	6	6	6	6	5	6	5	6	6	6	5	5
	6	5	5	5	5	5	5	5	5	6	6	5	5	5	5	5	5	5	5	6	5	5	5	6	5	5	5	5	5	5	6	6	5	6	5	5	5	3	3	5	1
06	7	6	6	6	6	7	6	6	6	6	7	7	6	6	6	6	6	6	6	5	5	5	5	5	6	6	6	5	6	6	4	4	4	5	5	5	7	7
	6	5	6	5	5	5	5	4	5	5	6	5	5	5	5	5	5	5	4	5	4	4	4	4	4	4	5	3	4	4	4	4	4	4	6	5	6	6	2	5	5	1
07	7	6	5	4	6	7	4	5	6	7	7	5	6	5	6	6	7	7	5	6	5	4	5	5	6	7	6	5	5	6	6	6	6	5	5	7	5
	7	5	4	6	6	5	5	3	5	5	6	5	7	5	5	5	6	6	7	6	5	5	5	6	5	7	5	6	5	6	5	6	7	6	6	6	5	5	3	1	6	1
08	7	5	6	3	4	5	5	3	4	5	7	3	5	4	6	4	6	7	5	5	4	5	6	6	6	6	4	6	6	7	0	6	5	5	5	4	4	6
	4	3	2	5	3	3	1	1	3	6	4	3	3	4	3	4	4	4	2	2	4	3	5	2	5	4	4	1	5	4	3	6	2	3	4	2	4	2	2	1	6	1
09	7	7	7	5	7	7	4	5	7	6	7	4	5	6	7	5	7	7	5	4	6	6	5	7	7	6	6	6	7	4	5	5	6	6	6	7	6	5
	7	6	6	5	4	6	3	6	5	4	6	3	5	5	4	5	7	6	4	6	7	7	5	6	7	6	7	6	6	5	5	5	7	6	5	6	5	6	3	2	5	1
10	5	7	7	2	5	5	3	2	5	5	6	5	7	5	7	3	6	7	6	6	5	5	6	6	7	5	5	5	6	6	3	5	3	5	5	5	4	6
	5	6	6	4	5	5	2	5	6	6	6	5	6	5	6	3	5	6	4	6	6	4	5	6	6	6	5	5	4	5	5	5	6	3	4	5	4	2	6	2	3	6	1
11	7	6	7	5	6	7	4	3	6	5	7	5	7	6	7	6	7	7	7	7	7	7	7	7	7	7	6	5	7	7	7	6	6	6	7	6	7	7	7
	4	4	6	3	2	3	1	1	6	3	6	2	5	5	3	5	5	6	3	3	5	3	2	6	4	5	3	6	2	6	3	3	3	3	4	3	2	5	2	3	3	1
12	5	7	6	1	4	5	6	7	5	6	7	5	7	5	7	7	7	7	6	3	2	4	6	3	7	7	7	6	4	6	6	6	4	6	3	4	7	7
	4	6	5	6	4	4	5	5	5	7	7	5	2	6	7	6	5	6	3	4	3	4	6	4	7	7	5	3	5	7	5	7	4	5	4	6	6	6	2	2	6	1
13	5	7	5	3	7	7	6	5	6	7	7	5	6	6	7	5	7	7	7	7	6	6	7	6	7	7	6	7	7	7	6	6	7	5	4	5	6	6
	6	7	5	5	6	5	6	6	4	5	6	3	6	5	6	4	6	6	6	5	5	4	5	5	4	6	4	5	5	6	4	6	6	5	5	5	5	5	2	5	5	1
14	4	5	6	6	7	5	4	3	5	7	7	6	7	7	7	5	6	7	6	6	5	4	7	7	7	7	7	6	7	5	6	6	6	7	5	3	5	5
	7	4	5	5	6	7	4	1	5	6	4	5	7	6	5	3	5	5	4	4	5	4	6	6	7	5	5	4	5	5	6	5	4	6	6	6	5	4	1	1	5	1
15	7	6	5	4	6	7	5	3	5	6	7	5	6	6	6	5	7	7	6	6	5	6	7	7	7	7	6	6	7	6	4	4	5	6	4	3	6	5
	5	5	4	6	6	5	3	1	4	6	5	5	6	5	6	5	5	5	4	5	4	5	6	6	4	5	5	4	6	6	4	1	4	4	4	4	3	4	3	4	7	1
16	6	6	6	6	6	6	2	4	4	6	7	5	7	5	5	5	7	7	5	5	5	6	6	6	7	7	7	5	6	6	5	6	6	.	6	6	6	6
	6	1	6	6	6	6	1	1	4	6	6	4	6	5	5	5	7	7	5	5	6	6	6	6	7	7	6	5	6	6	4	6	6	6	5	6	6	6	2	4	6	1
17	5	1	3	7	6	7	1	1	2	5	7	6	5	5	1	1	5	6	7	6	7	4	7	4	7	6	7	6	6	7	6	6	3	6	4	3	3	3
	5	1	2	6	4	6	1	1	1	6	6	1	6	5	1	5	4	5	5	5	6	5	7	1	7	6	4	6	5	4	4	5	3	7	7	6	5	5	1	4	7	1
18	6	7	7	6	7	6	5	3	7	5	6	6	6	7	7	5	5	7	7	7	5	6	7	5	7	5	5	5	5	5	7	6	5	5	5	1	2	9	7
	7	7	5	7	7	5	5	5	7	7	6	6	6	5	7	5	5	7	6	7	5	6	7	7	5	6	5	6	7	7	5	7	5	5	6	6	7	7	3	4	6	1

Appendix C
Respondent Statistical Results

Effectiveness of HR Systems Questionaire Groupings, Means, and Gaps

No/Group	1	2	3	4	5	6	7	Mean	8	9	10	11
01	5.50	5.43	5.80	5.50	6.25	5.00	5.33	5.54				
01	5.50	5.14	4.40	4.17	4.75	4.60	5.67	4.89				
Gap	0.00	0.29	1.40	1.33	1.50	0.40	-0.33	0.66	3	2	6	1
02	5.38	4.43	5.60	5.33	5.00	5.00	6.33	5.30				
02	3.75	3.14	3.20	2.50	3.25	1.00	4.33	3.03				
Gap	1.63	1.29	2.40	2.83	1.75	4.00	2.00	2.27	2	3	5	1
03	4.75	5.00	5.00	5.00	4.25	5.20	5.67	4.98				
03	3.88	3.29	4.80	3.67	3.00	5.00	5.67	4.18				
Gap	0.88	1.71	0.20	1.33	1.25	0.20	0.00	0.80	1	4	5	1
04	6.00	5.29	5.60	6.33	5.25	6.00	6.33	5.83				
04	4.63	4.86	3.00	2.50	3.25	3.00	4.67	3.70				
Gap	1.38	0.43	2.60	3.83	2.00	3.00	1.67	2.13	2	2	6	1
05	5.75	5.57	5.40	6.00	5.50	5.60	5.67	5.64				
05	5.38	5.29	5.20	5.00	5.25	5.00	5.33	5.21				
Gap	0.38	0.29	0.20	1.00	0.25	0.60	0.33	0.43	3	3	5	1
06	6.00	5.14	5.60	6.00	6.50	5.20	6.33	5.83				
06	5.13	4.00	5.00	4.67	5.50	4.60	4.67	4.79				
Gap	0.88	1.14	0.60	1.33	1.00	0.60	1.67	1.03	2	5	5	1
07	6.00	5.29	5.40	5.33	6.25	5.80	6.33	5.77				
07	6.25	5.71	5.00	5.17	5.00	5.40	5.67	5.46				
Gap	-0.25	-0.43	0.40	0.17	1.25	0.40	0.67	0.31	3	1	6	1
08	5.75	5.00	5.00	4.50	4.75	4.40	5.33	4.96				
08	3.88	2.29	3.40	3.83	4.00	2.60	3.67	3.38				
Gap	1.88	2.71	1.60	0.67	0.75	1.80	1.67	1.58	2	1	6	1
09	6.13	5.29	6.40	6.00	5.50	6.00	6.33	5.95				
09	5.75	5.29	6.00	4.67	5.00	5.40	6.00	5.44				
Gap	0.38	0.00	0.40	1.33	0.50	0.60	0.33	0.51	3	2	5	1
10	5.13	4.14	5.60	5.33	4.50	5.80	6.33	5.26				
10	5.00	4.00	5.00	5.33	4.25	5.80	5.67	5.01				
Gap	0.13	0.14	0.60	0.00	0.25	0.00	0.67	0.25	2	3	6	1
11	6.50	5.71	6.60	6.17	6.25	6.60	7.00	6.40				
11	4.63	2.86	4.20	3.17	3.75	3.80	4.00	3.77				
Gap	1.88	2.86	2.40	3.00	2.50	2.80	3.00	2.63	2	3	3	1
12	5.00	5.86	5.20	4.83	6.75	5.20	6.33	5.60				
12	5.88	4.57	4.60	5.17	6.25	5.20	4.33	5.14				
Gap	-0.88	1.29	0.60	-0.33	0.50	0.00	2.00	0.45	2	2	6	1
13	5.63	6.14	6.00	6.33	6.00	6.60	6.67	6.20				
	5.63	5.71	4.60	4.67	4.75	5.40	5.00	5.11				
Gap	0.00	0.43	1.40	1.67	1.25	1.20	1.67	1.09	2	5	5	1
	5.50	5.43	5.60	6.50	5.50	6.20	6.33	5.87				
	5.38	4.00	5.00	5.50	4.50	5.00	7.00	5.20				
15	0.13	1.43	0.60	1.00	1.00	1.20	-0.67	0.67	1	1	5	1
	5.63	5.00	5.80	6.00	5.50	5.80	6.67	5.77				
	5.00	3.00	4.60	5.33	4.50	5.20	5.00	4.66				
Gap	0.63	2.00	1.20	0.67	1.00	0.60	1.67	1.11	3	4	7	1

16	6.38	4.86	6.20	5.33	5.75	5.40	6.67	5.80				
16	6.13	4.29	5.80	5.17	5.75	4.20	6.33	5.38				
Gap	0.25	0.57	0.40	0.17	0.00	1.20	0.33	0.42	2	4	6	1
17	5.63	4.29	5.20	5.33	3.00	3.60	6.33	4.77				
17	5.63	4.00	3.40	3.83	5.25	2.40	6.33	4.41				
Gap	0.00	0.29	1.80	1.50	-2.25	1.20	0.00	0.36	1	4	7	1
18	5.00	5.00	5.60	6.50	5.50	6.40	6.33	5.76				
18	6.50	5.57	5.20	6.50	6.50	6.60	5.33	6.03				
Gap	-1.50	-0.57	0.40	0.00	-1.00	-0.20	1.00	-0.27	3	4	6	1
Mean Exp.	5.65	5.16	5.64	5.69	5.44	5.54	6.24	5.62				
Mean Perf.	5.22	4.28	4.58	4.49	4.69	4.46	5.26	4.71				
Mean Gap	0.43	0.88	1.07	1.19	0.75	1.09	0.98	0.91				

Appendix D
Correlation Statitistic

TOTAL OBSERVATIONS: 18

	FACTOR1E	FACTOR1P	FACTOR2E	FACTOR2P	FACTOR3E
N OF CASES	18	18	18	18	1
MINIMUM	4.750	3.750	4.140	2.290	5.000
MAXIMUM	6.500	6.500	6.140	5.710	6.600
RANGE	1.750	2.750	2.000	3.420	1.600
MEAN	5.648	5.218	5.159	4.278	5.644
VARIANCE	0.230	0.663	0.273	1.127	0.196
STANDARD DEV	0.480	0.814	0.522	1.062	0.442
STD. ERROR	0.113	0.192	0.123	0.250	0.104
SKEWNESS(G1)	-0.096	-0.428	-0.246	-0.221	-0.551
KURTOSIS(G2)	-0.660	-0.706	-0.290	-1.090	-0.228
SUM	101.660	93.930	92.870	77.010	101.600

	FACTOR3P	FACTOR4E	FACTOR4P	FACTOR5E	FACTOR5P
N OF CASES	18	18	18	18	18
MINIMUM	3.000	4.500	2.500	3.000	3.000
MAXIMUM	6.000	6.500	6.500	6.750	6.500
RANGE	3.000	2.000	4.000	3.750	3.500
MEAN	4.578	5.684	4.492	5.444	4.694
VARIANCE	0.729	0.357	1.148	0.835	0.997
STANDARD DEV	0.854	0.597	1.072	0.914	0.998
STD. ERROR	0.201	0.141	0.253	0.215	0.235
SKEWNESS(G1)	-0.425	-0.273	-0.388	-0.985	0.026
KURTOSIS(G2)	-0.606	-0.979	-0.433	0.960	0.720
SUM	82.400	102.310	80.850	98.000	84.500

	FACTOR6E	FACTOR6P	FACTOR7E	FACTOR7P	AGEGROUP
N OF CASES	18	18	18	18	18
MINIMUM	3.600	1.000	5.330	3.670	1.000
MAXIMUM	6.600	6.600	7.000	7.000	3.000
RANGE	3.000	5.600	1.670	3.330	2.000
MEAN	5.544	4.456	6.239	5.259	1.167
VARIANCE	0.592	1.961	0.207	0.778	0.500
STANDARD DEV	0.769	1.401	0.455	0.882	0.707
STD. ERROR	0.181	0.330	0.107	0.208	0.167
SKEWNESS(G1)	-0.771	-0.960	0.769	0.331	-0.228
KURTOSIS(G2)	0.471	0.313	-0.069	-0.647	-0.893
SUM	99.800	80.200	112.310	94.670	39.000

	POSITION	HRSYSTEM
N OF CASES	18	18
MINIMUM	1.000	3.000
MAXIMUM	5.000	7.000
RANGE	4.000	4.000
MEAN	2.944	5.556
VARIANCE	1.703	0.850
STANDARD DEV	1.305	0.922

STD. ERROR	0.308	0.217
SKEWNESS(G1)	-0.059	-0.863
KURTOSIS(G2)	-1.110	1.515
SUM	53.000	100.000

TOTAL OBSERVATIONS: 18

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
N OF CASES	18	18	18	18	18
MINIMUM	-1.500	-0.570	0.200	-0.330	-2.250
MAXIMUM	1.880	2.860	2.600	3.830	2.500
RANGE	3.380	3.430	2.400	4.160	4.750
MEAN	0.429	0.882	1.067	1.194	0.750
VARIANCE	0.800	0.977	0.654	1.246	1.199
STANDARD DEV	0.895	0.988	0.809	1.116	1.095
STD. ERROR	0.211	0.233	0.191	0.263	0.258
SKEWNESS(G1)	-0.099	0.558	0.695	0.841	-1.103
KURTOSIS(G2)	-0.185	-0.555	-0.911	0.128	1.516
SUM	7.720	15.870	19.200	21.500	13.500

	FACTOR6	FACTOR7	GAP	AGE	POSITION
N OF CASES	18	18	18	18	18
MINIMUM	-0.200	-0.670	-0.270	1.000	1.000
MAXIMUM	4.000	3.000	2.630	3.000	5.000
RANGE	4.200	3.670	2.900	2.000	4.000
MEAN	1.089	0.982	0.913	2.167	2.944
VARIANCE	1.314	0.962	0.606	0.500	1.703
STANDARD DEV	1.146	0.981	0.778	0.707	1.305
STD. ERROR	0.270	0.231	0.183	0.167	0.308
SKEWNESS(G1)	1.225	0.153	0.888	-0.228	-0.059
KURTOSIS(G2)	0.638	-0.802	-0.105	-0.893	-1.110
SUM	19.600	17.680	16.430	39.000	53.000

	HRSYSTEM
N OF CASES	18
MINIMUM	3.000
MAXIMUM	7.000
RANGE	4.000
MEAN	5.556
VARIANCE	0.850
STANDARD DEV	0.922
STD. ERROR	0.217
SKEWNESS(G1)	-0.863
KURTOSIS(G2)	1.515
SUM	100.000

EARSON CORRELATION MATRIX

	FACTOR1E	FACTOR1P	FACTOR2E	FACTOR2P	FACTOR3E
FACTOR1E	1.000				
FACTOR1P	0.120	1.000			
FACTOR2E	0.202	0.246	1.000		
FACTOR2P	0.003	0.764	0.385	1.000	
FACTOR3E	0.634	0.245	0.265	0.148	1.000
FACTOR3P	0.066	0.599	0.193	0.430	0.358
FACTOR4E	0.256	0.308	0.344	0.399	0.540
FACTOR4P	-0.225	0.733	0.096	0.419	0.006
FACTOR5E	0.290	0.353	0.718	0.339	0.414
FACTOR5P	-0.005	0.861	0.172	0.526	0.046
FACTOR6E	0.162	0.250	0.515	0.359	0.595
FACTOR6P	-0.243	0.611	0.347	0.536	0.144
FACTOR7E	0.371	0.288	0.067	0.026	0.608
FACTOR7P	-0.064	0.497	-0.214	0.382	0.069
AGEGROUP	0.206	0.392	0.220	0.460	0.314
POSITION	-0.078	0.061	-0.124	-0.000	0.168
HRSYSTEM	-0.292	0.281	-0.435	0.116	-0.468

	FACTOR3P	FACTOR4E	FACTOR4P	FACTOR5E	FACTOR5P
FACTOR3P	1.000				
FACTOR4E	0.217	1.000			
FACTOR4P	0.749	0.200	1.000		
FACTOR5E	0.368	0.263	0.264	1.000	
FACTOR5P	0.540	0.104	0.760	0.347	1.000
FACTOR6E	0.421	0.716	0.297	0.531	-0.000
FACTOR6P	0.788	0.330	0.821	0.386	0.501
FACTOR7E	0.148	0.464	0.106	0.211	0.138
FACTOR7P	0.513	0.213	0.434	-0.273	0.244
AGEGROUP	0.338	0.202	0.339	0.493	0.347
POSITION	0.147	0.240	0.091	-0.114	0.178
HRSYSTEM	-0.133	-0.307	0.292	-0.345	0.307

	FACTOR6E	FACTOR6P	FACTOR7E	FACTOR7P	AGEGROUP
FACTOR6E	1.000				
FACTOR6P	0.575	1.000			
FACTOR7E	0.501	0.096	1.000		
FACTOR7P	0.005	0.344	0.030	1.000	
AGEGROUP	0.321	0.382	-0.071	-0.168	1.000
POSITION	0.032	0.118	0.358	-0.005	-0.117
HRSYSTEM	-0.485	0.020	-0.198	0.246	0.120

	POSITION	HRSYSTEM
POSITION	1.000	
HRSYSTEM	-0.022	1.000

MBER OF OBSERVATIONS: 18

DEP VAR:HRSYSTEM N: 18 MULTIPLE R: .700 SQUARED MULTIPLE R: .48
ADJUSTED SQUARED MULTIPLE R: .132 STANDARD ERROR OF ESTIMATE: 0.85

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL
CONSTANT	4.676	1.654	0.000	.	2.827	0.01
FACTOR1P	-0.150	0.887	-0.132	0.0832875	-0.169	0.86
FACTOR2P	0.051	0.381	0.058	0.2647756	0.133	0.89
FACTOR3P	-0.984	0.472	-0.911	0.2674303	-2.086	0.06
FACTOR4P	0.660	0.619	0.768	0.0984970	1.066	0.31
FACTOR5P	0.236	0.660	0.255	0.0997966	0.357	0.72
FACTOR6P	-0.071	0.425	-0.107	0.1225568	-0.166	0.87
FACTOR7P	0.416	0.383	0.398	0.3798646	1.087	0.30

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	7.068	7	1.010	1.369	0.315
RESIDUAL	7.376	10	0.738		

DEP VAR:HRSYSTEM N: 18 MULTIPLE R: .615 SQUARED MULTIPLE R: .37
ADJUSTED SQUARED MULTIPLE R: .000 STANDARD ERROR OF ESTIMATE: 0.94

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL
CONSTANT	11.871	4.381	0.000	.	2.710	0.02
FACTOR1E	-0.186	0.693	-0.097	0.4772363	-0.268	0.79
FACTOR2E	-0.595	0.696	-0.337	0.4000856	-0.856	0.41
FACTOR3E	-0.738	0.945	-0.354	0.3026434	-0.781	0.45
FACTOR4E	0.300	0.593	0.194	0.4216595	0.506	0.62
FACTOR5E	0.207	0.403	0.205	0.3887713	0.513	0.61
FACTOR6E	-0.485	0.582	-0.405	0.2632427	-0.833	0.42
FACTOR7E	0.293	0.683	0.145	0.5473041	0.429	0.67

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
REGRESSION	5.462	7	0.780	0.869	0.561
RESIDUAL	8.982	10	0.898		



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