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ASSESSING THE BENEFITS OF IT INVESTMENTS IN KNOWLEDGE WORK: A HUMAN RESOURCE ACCOUNTING PERSPECTIVE

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ABSTRACT

Organizations face many difficulties evaluating the benefits of their Information Technology (IT) investments, many of which are intangibles and relate to employees of the organization. Particularly in the knowledge work domain where human resources are the major productive asset, existing methods are unsatisfactory largely because they tend to be deficient in capturing the intangible impacts of IT use. This paper suggests that IT investments on knowledge workers can be assessed using a Human Resource Accounting (HRA) perspective. Human resource accounting quantifies the effects of human resource enhancing strategies on the value of people as organizational resources. Investing information technologies in knowledge workers in one such strategy. The paper illustrates how a HRA model can be applied to assess IT benefits to a particular knowledge worker group, that of external auditors.

INTRODUCTION

Despite plummeting hardware and software costs, organizations continue to find themselves in a quandary justifying purchases of information technologies (IT) (for example, see Davenport, 1989). IT costs may have drastically reduced in recent years, but the magnitude of today's IT investment continues to grow. Nevertheless, IT costs have been relatively easy to measure and control. On the other hand, IT benefits have been difficult to assess because they tend to elude to qualitative intangibles that are not easily calibrated.

Traditional cost-benefit evaluation of computer systems tend to focus only on the technical and economic impacts (see Hopwood, 1983 and Driscoll, 1982). For instance, according to Strausmann (1985), a typical IT investment proposal of a 100 pages spends over 20 pages discussing technical matters and devotes only a part of what is left to an explanation of the expected benefits and how the savings would be delivered. Consequently, management's attention is usually over-aptopositioned to the costs involved since the cost of the equipment, and supporting facilities are more tangible and relatively discernible.

Available methods of measuring IT benefits in cost justification approaches do not satisfactorily address the issue of measuring expected intangible benefits. The conventional accounting-oriented approaches, such as the use of ROA are deficient in that they fail to capture the qualitative human and/or organizational intangible benefits that are the predominant benefits of IT investments, overemphasizing instead the quantitative/relative benefits that are often limited and meaningless.

The more recent academic writings advocate measuring the business value of IT benefits (for example see Strausmann, 1985; Swenson, 1988). They offer viable and practical alternatives to the organizations doing the measuring to suit their particular needs, cultures and competitive environments (Berger, 1985). These firm-wide measures serve the purpose of facilitating the decision to invest in IT, but are deficient in assessing and monitoring the intangible benefits that accrue to the firm from the use of IT by the individual user. In the knowledge work domain, IT usage can affect the quality and quality of the information output directly and indirectly through its effects on the individual knowledge worker. Intangible benefits such as work satisfaction and increased motivation can accrue to the individual knowledge worker using the IT. Because such intangible benefits can enhance knowledge worker productivity, a more appropriate measure is needed to capture and assess IT usage by knowledge workers.

This paper describes how human resource accounting (HRA) can be a useful tool for assessing the impact of IT on an individual's value to the organization. Specifically, HRA accounts for the enhancement of skills, changes in roles, satisfaction levels, etc., all of which are human and organizational intangibles which can arise from the introduction of IT. With human resource accounting, such intangibles are quantifiable and can be translated into dollar denunciation on which other organizational investment payoff decisions can be based. HRA also allows for the monitoring of positive or negative shifts in the intangibles over time.

The next section of this paper describes the basic concepts underlying HRA. To illustrate the HRA concept in relation to IT investments, we draw examples from the knowledge work domain, in particular auditing, and use external auditors as our knowledge worker target group.

External auditors were chosen for two reasons. First, they are in the area of knowledge work and their services are largely dependent on the human resource who extensively use IT in their work, and second, the authors have previously worked as external auditors, and hold first-hand knowledge of the type of work an auditor does and how IT can affect the nature of the audit. Nevertheless, the model is sufficiently generic to permit application to other types of knowledge workers.

BASIC CONCEPTS OF HUMAN RESOURCE ACCOUNTING

Many of today's economies have transformed from industrial to information and service based (Toffler, 1974). Labor has become the largest and most expensive economic factor of production, and human capital becomes the critical asset for improving productivity as well as a key strategic variable for sustaining competitiveness in the market (Thurrow, 1991). Strausmann (1985) noted that falling IT prices makes technology relatively inexpensive, but "the people using it cost the money". Thus the focus of the information age is on people rather than on machines.

While organizations readily acknowledge the importance of human capital, evaluating investments in human capital is problematic. Under traditional accounting conventions, physical investments are treated as assets while the monetary outlay incurred in acquiring an employee is perceived as an expenses. For instance, funds required to recruit, select, train and maintain people are written off as expenses, even though these expenditure actually represent investments which can render future value to the firm. As a result, management consciously or unconsciously thinks of people as
"expenses" to be minimized rather than "assets" to be optimized. Human capital, however, do offer future economic benefits to the firm (FASB No. 3, SFAC No. 3, 1980) and are therefore "assets" of the firm (Tay, 1988; Edmund and Rogan, 1987).

Human resource accounting (HRA) attempts to resolve this anomaly by recognizing skills, experience, and knowledge which people possess as assets of an organization. The primary function of HRA is to re-orient management's perception of human resources, so that they are seen as organizational assets, and to concentrate on ways of enhancing an employer's value to the organization. Besides surfacing both costs and value of human resources, HRA also provides a mechanism for quantifying the effects of human resource enhancing strategies upon the cost and value of people as organizational resources. Investing in computer technologies is one such strategy. Introducing such investments has a range of impacts both on employee skills and their market value as well as their behavioral dimension such as productivity and organizational commitment. These affect the value of the human asset to the firm. The central theme of this paper is to assess the value of IT (hardware, software, communications) invested in knowledge workers using HRA to see if IT increases their worth to the organization.

HRA Approaches

Traditionally, there are two main approaches to measuring human resources: the monetary approach, and the non-monetary approach.

The monetary approach

Under the monetary approach, human resources are measured in monetary units, i.e., dollars, pounds, yen, etc., recorded at their nominal amount. The approach can be further classified according to the method of accounting treatment adopted - the capitalization-amortization method and the valuation method.

Capitalization-amortization method: The capitalization-amortization method accounts for the investment of people in terms of costs incurred in acquiring, maintaining and developing human resources. Human capital formation expenses, such as hiring, selection, training and development costs relating to employees, are recorded and amortized over the useful life of the employee or the period expected to benefit from the outlay, whichever is shorter. The human asset is reported as the unexpired portion of the capitalized amount. The asset attribute measured in this method could be:

1. historical cost, where the investment in employees of the firm are recorded as assets at the original amount of past outlays (for example, see Woodruff, 1970);
2. replacement cost of past outlays, where the costs to replace a firm's existing human resources are recorded as assets (Haltermann and Jones, 1967); or
3. current cost of equivalent services, where human resources could be recorded by reference to the cost of services provided by an improved labor force whose services are "equivalent" to those provided by the existing employees (defined by SAP 1 - Current Cost Accounting, 1983).

There are many criticisms of the capitalization-amortization method (for example, Belkaoui, 1985; Ma and Mahner, 1980). The chief of which is that this accounting treatment accounts for human assets on the basis of tangible costs. This does not adequately reflect employee's ability to perform nor the value of their services to the firm.

Valuation method: This method accounts for human resource value rather than cost, with provision for regular revaluation of the asset value. The approach focuses upon measuring and evaluating the future economic benefits expected to be generated by an organization's human assets. The economic benefits flowing from the human resource asset can be represented by:

1. present value of benefits to firm - this is the discounted value of the estimated future net contributions of employees to the earnings of the firm (for example see Flamholtz, 1971; Jaggi and Lau, 1976);
2. present value of employee's compensation - a surrogate measure which is the discounted employee's future compensation (Lev and Schwartz, 1971);
3. current values - a substitute for discounted expected cashflow valuation of the human resource, represented by the current price that exists in the market in which it is bought (entry price) or sold (exit price) (suggested by Henrekson, 1982; Ma et al, 1987); and
4. opportunity cost - another substitute, represented by "the maximum contribution that is forgone by using limited resources for a particular purpose" (defined by Horngren, 1982, p. 378; for example see Haltermann and Jones, 1967).

The above methods are not without criticism. The valuation method, however, is more conceptually attractive than the capitalization-amortization method as it offers a more valid reflection of the human asset value to the firm. This method accounts for certain employee characteristics such as age, experience, position in the organizational hierarchy which affect his or her value to the firm.

Non-monetary approaches

Non-monetary approaches to human resource measurement which are primarily derived from the behavioral science approach to human resources measurement assess the relative productivity of human resources. They "deal with an examination of the activities and attitudes of people and groups of people in order to discover causal relationships capable of prediction" (AAA, 1973, p. 175).

Illustrative of the approach is the work of Likert (1967) and Flamholtz (1972).

The Likert model: Likert (1967) investigated the relationship between a company's management system and its productivity. He formulated a model identifying the determinants of the productive capability of a firm's human organization (groups of people that comprise the firm), and thus reflecting the value of that human organization.

His model comprised of three classes of variables: causal, intervening, and end-result. According to Likert, the causal and intervening variables describe the internal state of the human organization (such as the loyalties, attitudes, motivation, performance, goals, and perceptions of all members and their collective capacity for effective action, interaction, communication, and decision making). These variables, in turn, determine the organization's end results (i.e. health and satisfaction, productivity and financial performance). For instance, a deterioration in, say, employee attitudes (an example of intervening variable) will, as indicated in Likert's findings, after a time-lag of 18 to 24 months result in decreased productivity and profitability. Likert therefore advocates that a firm's causal and intervening variables be measured and reported periodically in non-monetary terms using social and psychological measures so that their impact can be considered.

The Flamholtz model: Flamholtz (1973) revised and extended Likert's work to develop a model which focuses on an individual's value to an organization. His model presents a framework for understanding the factors that comprise and influence a person's value to an organization. His study suggests that the ultimate measure of a person's worth is his expected
realizable value, the product of interacting human and organizational determinants and the person’s satisfaction with the organization. Similar to Likert’s model, variables in Flammholz’s model can be measured in non-monetary terms to reflect changes in the value of human resources.

Flammholz’s monetary stochastic rewards model (1971) which uses the valuation method shares the same theoretical concepts in his non-monetary model.

Evaluation

In summary, both the monetary and non-monetary approaches are useful for decision-making. The monetary approaches, however, have the advantage over the non-monetary in competing for a decision maker’s attention as many organizational decisions are based on monetary terms. This is supported by Harrell and Klick (1980) who found that managers placed greater emphasis on monetary rather than on non-monetary measures of human resources in arriving at their decisions.

Nevertheless, monetary measures usually do not fully reflect the vital performance-related psychological changes in employees that come with organizational change. Intangible information collected in respect of human value cannot always be expressed in dollar terms (Cascio, 1987). Thus, where monetary measures are not available or not comprehensive enough, non-monetary measures can provide valuable sources of information of the impact of organizational changes on an employee’s human resource value.

Past empirical studies have shown the usefulness of non-monetary approaches (both the Likert and Flammholz models) in supplementing or even providing primary evidence of human resource value in an organization (for example, see Qureshi and Lund, 1975).

To assess the benefits of IT investments on knowledge workers, we suggest the application of the non-monetary Flammholz model. We are aware of its weaknesses. For instance, its focus on an individual’s worth to the firm may mean that the impact of the group or firm as a whole is not captured. Aggregating the individual’s value cannot account for the synergistic contribution (which can be positive or negative) of interacting individuals or groups. However, this weakness has little impact on and does not invalidate our claims for the use of the model in assessing IT benefits. We are not concerned with arriving at the total value of the firm’s labor force. Instead, we are concerned with measuring the effects of IT on processes and outcomes and the resultant value that IT may bring on the individual knowledge worker. This is because the use of IT must first be shown to cause micro-level changes in the processes or outcomes of individual knowledge workers for which the level of measurement tends to be the individual (Davis, et al, 1991). The individual level of analysis can offer a better understanding of the relationship of IT on knowledge worker productivity.

Many impacts of IT are non-monetary, psychological, and attitudinal in nature (see Driscoll, 1982; Hopwood, 1983). As such, Flammholz’s non-monetary model serves us well here because of its advantage over the monetary models in its ability to better capture the psychological and behavioral change in the knowledge worker as a result of introducing IT. Apart from the individual variables, the model explicitly addresses the additional dimension of organizational variables (not referred to in the Likert model) which interact with the individual variables and influence a person’s value. Each of these variables can possess its own unit of non-monetary but quantifiable measurement which is an advantage as IT may not influence each variable in the same direction nor magnitude. These same variables, according to Flammholz can also provide a theoretical foundation for developing monetary representations of the value of people. Table 1 summarizes the 2 HRA approaches and highlights the respective methods’ advantages and disadvantages.

The following section reviews the components or variables in the non-monetary Flammholz model (1972) in greater detail.

### Table 1: Human Resource Accounting Approaches

<table>
<thead>
<tr>
<th>Approaches</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td><strong>Monetary</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approaches</td>
<td>-Simple to use and understand</td>
<td>-Unrealistic, ignores human value measures</td>
</tr>
<tr>
<td>1. Capitalization-amortization method</td>
<td>-Historical cost</td>
<td>-Captures tangible costs only</td>
</tr>
<tr>
<td>2. Valuation method</td>
<td>-Present value of benefits</td>
<td>-Detracts from intangible variables</td>
</tr>
<tr>
<td>Non-monetary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approaches</td>
<td>-Quantifiable group measures</td>
<td>-Does not explicitly address organizational variables</td>
</tr>
<tr>
<td>1. Likert’s Model</td>
<td>-Captures human variables</td>
<td>-Not translatable to monetary measures</td>
</tr>
<tr>
<td>2. Flammholz’s model</td>
<td>-Quantifiable individual measures</td>
<td>-Does not satisfactorily capture group value</td>
</tr>
<tr>
<td></td>
<td>-Captures human and organizational variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Convertible to monetary measures</td>
<td></td>
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</tbody>
</table>

**DISCUSSION OF THE NON-MONETARY FLAMMHOtz MODEL**

Figure 1 below illustrates the various components and their interactions in the Flammholz model.

According to the model, a person’s net value\(^2\) to an organization is determined by (1) the individual’s conditional value; and (2) his or her probability of maintaining organizational membership. Both these variables affect the individual’s expected realizable value, the ultimate measure of an individual’s value to a formal organization.

An Individual’s Conditional Value -- E(CV)

An individual’s conditional value is the maximum potential value he or she can contribute to the organization. It represents a person’s potential value to an organization under the assumption that the person works for the organization until his or her retirement age.

\(^2\) A person’s net value is computed net of costs including IT incurred to increase the person’s value.


FIGURE 1
MODEL OF THE DETERMINANTS OF AN INDIVIDUAL'S VALUE TO A FORMAL ORGANIZATION

![Diagram showing determinants of individual and organizational value]


In the model, productivity is the central causal variable of an individual's conditional value. Productivity, present, past and expected, influences the individual's perception of promotions and transfer which affect the person's potential value to the organization. Productivity in turn, is determined by individual and organizational determinants.

The individual determinant comprises of 2 major variables: skills and activation level. Skills represent an individual's currently developed potential to provide services to an organization while activation level refers to the motivation level of an individual.

The organizational role an individual occupies and the reward structure of the organization are the main organizational determinants in the model. Role is defined as a set of behaviors expected of the person occupying a specified position in an organization. Rewards refer to the amount and type of consideration paid to an individual for services rendered.

According to Flamholtz, the organizational determinants affect the individual's potential value to the firm because of their hypothesized influences on activation level. Skills and activation level (motivation) interact to determine the person's potential for rendering services to an organization (see Lawler, 1965 and Vroom, 1964).

Probability of Maintaining Organizational Membership

The probability that the individual will maintain membership in the organization determines the extent to which the organization will realize the individual's potential services or conditional value.

Past research on causes of turnover suggests that there is an inverse relationship between need satisfaction and the likelihood of exiting (Fournier, DiCesare, and Pryor, 1966 in Flamholtz, 1972). In the model, therefore, satisfaction is seen as directly affecting the probability of the individual maintaining membership in the organization. It is hypothesized that satisfaction is the product of the interaction between the individual and organizational determinants of an individual's value. In other words, an individual may possess a set of skills and the motivation to apply them, but the organizational role he or she occupies and the rewards from the organization can moderate the value of services and influence the extent to which he or she is offered the opportunity to render potential services. To the extent that the organization maintains an individual's roles with the appropriate compensation, the individual will decide to stay or leave the firm.

Expected Realizable Value -- E(RV)

The expected realizable value is the expected value of an individual to an organization, subject to the likelihood that job may leave during the anticipated service life. This variable is affected by the two previously described variables: the expected conditional value and the probability that the person will maintain his or her organizational membership. The difference between E(VC) and E(RV) is then the implicit cost of turnover, that is, the opportunity value one organization forgoes when an employee leaves.

DISCUSSION ON THE APPLICATION OF THE MODEL TO VALUING IT INVESTMENTS

The following briefly reviews the audit process so as to give a better appreciation to the discussion on the application of the model which follows.

Audit Process

Figure 2 shows the 3 main phases and the principal steps auditors have to perform in a typical audit engagement. Depending on the size and complexity of the audit job, an engagement is usually undertaken by a team of auditors with varying degrees of audit experience and skills capable of executing the steps and completing the phases in the audit process.

When IT is introduced, the audit steps will be affected primarily because of the shift from a manual to a technological focus. The magnitude and severity of the change will depend largely on the types of IT applications (whether generic, customized) and level of IT integration (within the audit department or within the firm as a whole). For our discussion of IT applications in the audit process, we are primarily referring to microcomputer and related software.

Figure 2 also shows some examples of microcomputer software applications to each phase of the audit process. The following will discuss how IT introductions such as these will impact the value of the auditor and thus the value of the IT invested.

FIGURE 2
THE AUDIT PROCESS AND MICROCOMPUTER SUPPORT

<table>
<thead>
<tr>
<th>Audit Phases</th>
<th>Principal Audit Steps</th>
<th>Microcomputer Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning the Audit</td>
<td>- Assess client, industry and business risks</td>
<td>- Expert systems</td>
</tr>
<tr>
<td></td>
<td>- Prepare audit programs</td>
<td>- Analytical review support</td>
</tr>
<tr>
<td></td>
<td>- Perform analytical review</td>
<td>- Regression</td>
</tr>
<tr>
<td></td>
<td>- Schedule work</td>
<td>- Ratio analysis</td>
</tr>
<tr>
<td></td>
<td>- Assign professional staff to engagements</td>
<td>- Graphing</td>
</tr>
<tr>
<td></td>
<td>- Perform field work</td>
<td>- Charting</td>
</tr>
<tr>
<td></td>
<td>- Study and evaluate internal controls, analytical procedures</td>
<td>- Wordprocessing</td>
</tr>
<tr>
<td></td>
<td>- Tests of transactions and balances</td>
<td>- PERT, GANTT charts</td>
</tr>
<tr>
<td>Reporting the findings</td>
<td>- Document findings</td>
<td>- Budgeting spreadsheets</td>
</tr>
<tr>
<td></td>
<td>- Write up and issue Audit Report</td>
<td>- -</td>
</tr>
</tbody>
</table>

Applying The Model

This section discusses how the introduction of IT can affect each of the 4 components which form the individual and organizational determinants of an auditor’s value.

Skills

Generally, a person possesses 3 main sets of skills -- technical, administrative and human interaction skills, as suggested by Floyd Mann (1966) in his Ph.D. dissertation. The sets and level (quality) of skills a person possesses set limits on the nature and magnitude of the services he can render to an organization. Likewise, the auditor possesses technical skills such as knowledge of the accounting standards, audit procedures and ability to carry out technical audit steps such as vouching, testing of balances and transactions; administrative skills as in scheduling field visits and assignment of staff duties; and human interaction skills as in coordinating and liaising with clients and professional staff in the audit. In addition, an auditor is expected to possess an added set of skill, distinct from the above 3: the conceptual skill.

Conceptual skill is the mental ability to co-ordinate and integrate all of the firm's interests and activities. It involves the auditor’s ability to see the firm as a whole and to understand how its parts depend on each other. It also involves the auditor’s ability to understand how a change in any given part can affect the firm as a whole. An auditor needs enough conceptual skill to recognize how the various factors in a given situation can interact so that the actions he or she takes will be in the best interests of the total firm. For instance, conceptual skill is evident in an auditor who is able to “see” how the work performed in a particular audit step affects work to be performed in subsequent phases of the audit and the impact on the audit as a whole. It also includes the auditor’s ability to recognize implications to the client’s organization.

These sets of skills are relatively stable and enduring, but can be changed by various forms of training. The level of skills is expected to increase over time as the auditor gains experience through on-the-job training and formal in-house training usually supplied by the accounting firms.

With the introduction of IT, especially microcomputers and their related audit software, an auditor’s skills are expected to be enlarged and improved. Firstly, IT introduction can lead to acquisition of an added skill set, that of IT skills (it may be more specific depending on the IT introduced). Secondly, it can enhance the auditor’s conceptual skills (audit judgement, evaluative and decision-making abilities), and his or her administrative skills. For example, as depicted in figure 2, auditing software such as the analytical review support, and expert systems enhance an auditor’s judgement, evaluative and decision-making abilities, whereas productivity tools such as word processor automation, word processing, flowcharts, ERP, budgeting spreadsheets are used to augment the administrative skills of the auditor.

However, the extent to which the value of IT is harnessed by auditors depends on IT level in micro-computing auditing. For example, if auditors merely mechanically operate a standard software package (automating), instead of actively utilizing the support packages in innovative and ingenious ways to improve their audit decision making abilities (informing), then IT has not been utilized to its fullest potential. Indeed, it may even be a case of deskilling, where the auditors’ previous audit skills get replaced by automation. In many cases, the extent to which auditors reap the benefits of IT depends on their experience with auditing applications of IT. Consequently, one would expect organizations to incur substantial costs of training during the initial years of IT implementation, and only see the benefits gained after employees have attained a certain level of competence with the technology.

Activation level

An individual’s activation level can affect the quality and quantity of work performed. It is not constant and may vary as a result of changes in physiological and psychological determinants and be influenced by environmental and task changes. The adoption of IT can affect the work flow, nature of job and espousing relationships and thus influence the individual’s outlook towards his job and activation level.

Previous literature reviews on the impacts of computer and office automation (Attean and Rulie, 1984; Hirescheim, 1986) showed that employees perceive information technology as either threats - making most of their existing skills obsolete, or boons - enriching their jobs by taking the drudgery part of their work away.

As discussed above, auditors may view IT as an automation tool to replace his or her skills and thus come to view IT as a threat. Auditors may also experience difficulty overcoming their psychological discomfort with the presence of IT. In either instances, auditors may experience a drop in their activation level and consequently negatively affect the auditor’s value to the organization.

While the above is a possibility, IT introductions today tend to be better received particularly among the better educated. Auditors are thus likely to appreciate that the use of IT can potentially eliminate the drudgery of various clerical, routine tasks and enlarge their job scope. An individual using IT may therefore be more enthusiastic with his job and reflect higher job motivation. Kuing (1980) found that professionals welcome IT as a liberating relief of the time-consuming and repetitive parts of their work. Straussman (1985) found that auditors experienced enhanced professional status as a result of using IT. Their greatest satisfaction came from an improved ability to keep up with a large volume of cases, and their favorable reactions to the improved quality of legal support since IT frees the attorney from “desk-work” and provided them with more opportunities for personal contact.

In reality, both skills and activation level interact to determine the level of productivity or conditional value of an individual. For instance, if an auditor has excellent technical and administrative skills, and prefers audit assignments that call for such skills, then the use of IT may render his skills obsolete, and in turn, lower his motivation level. He may no longer find his job fulfilling as IT makes his existing skills e.g., judgment in audit sampling, or tackling unwieldy consolidated statements, obsolete.

On the other hand, if an audit senior has conceptual skills, as well as technical and administrative skills, and prefers to spend time with clients making creative operational, management and strategic recommendations on how to improve their operations. Their greater satisfaction comes from an improved ability to perform the traditional audit, as well as having time to shift to creative work, including consulting-like work, such as making operational, management and strategic recommendations to clients on how to improve the operations of their companies and so enhance the professional status of the audit firm.

Role

The position an auditor occupies such as an assistant, a senior, manager or partner will define the set of behaviors and task activities he is expected to perform. Generally, role is synonymous with the position an individual holds in an organization as positions normally specify the task and responsibilities of the incumbent.

The different position an individual occupies will require different level of skills in different combination of skill levels. For instance the role of an audit assistant requires the individual to utilize more technical skills as he is normally sent to perform the field work such as testing of balances, transactions, workpaper documentation, etc. An audit manager’s role on the other hand, requires more administrative, conceptual and human interactive skills such as in the planning of the audit which is normally his responsibility.

When IT is introduced, the role or set of tasks and behaviors for each position in the hierarchy has the potential to expand. The role of auditors at each position or hierarchical level, whether assistant, senior or manager may have their existing tasks enlarged and enriched to include a broader spectrum of audit steps not previously expected of them because of lack of skills and experience. For instance, audit manager may use the use of IT to augment their lack of experience, be expected to perform more administrative and conceptual work in addition to the technical field tasks.

Thus, with skill enhancement from the use of IT, more and more of the audit steps normally performed by the higher positions under the usual audit process may now be performed by those at the lower end of the hierarchy.
The traditional specialist role performed by the audit profession where their primary function is to give a true and fair opinion about the financial viability of the client may be changed. With the use of IT to enhance their technical, administrative skills, auditors at each hierarchical level have the potential to expand their current roles as specialists to become generalists (see Simonsmann, 1985). Each individual of the accounting firm may eventually be able to provide full services to customers, rather than just working on small fragments of it.

As generalists, they may even be able to integrate a variety of products and services (auditing, taxation advice, management consulting) so as to add value in meeting a customer’s unique needs. For example, with the aid of IT, auditors may be able to take on the role of management consultants. Their ability to provide consultancy-like services stems from the experiential learning from the wide variety of audit jobs they tackle annually. In many cases, an auditor frequently migrates to the management consultancy department after working as an apprentice in the auditing department. Roles of the auditors as specialists to generalists may signal a change in the division of work for the accounting firm as a whole.

For example, IT can liberate and provide a melting pot environment where a professional worker is employed to tackle a larger scope. Accounting firms no longer need functional specialists. New entrants to the profession are trained as generalists of specific industries and a likely re-organization of the firm by industry - construction, banking & insurance, retail, etc. of the firm may enable to better serve the varied needs of clients of specific industries. Such role changes if facilitated by the firm can therefore positively improve the auditors’ activation levels and thus enhance his value.

**Rewards**

In the model, organizational rewards is an important determinant of an individual’s job satisfaction. Job satisfaction, in turn, determines turnover (or the probability of maintaining membership with the firm). In general, a worker derives greater job satisfaction when they perceive that they are rewarded equitably according to types and quality of services rendered (Lawler, 1977; Porter and Lawler, 1968). Their effectiveness decline if they merely get paid for holding a job.

As discussed in the previous paragraphs, auditors may experience a possible role enlargement resulting from the adoption of IT in auditing. Auditing firms must ensure that individuals are sufficiently compensated for their new role in terms of added tasks and responsibilities. Otherwise, workers may harbor resentment and suffer burn-out effects. A Business Week (November 23, 1988) reader provides anecdotal evidence of such an effect:

> "At my staff-level desk job, I routinely use voice mail, electronic mail, a facsimile machine, and a personal computer. None of these technologies has had a liberating effect on the way I do my work. To the contrary, I find myself chained to my desk into the evening hours more and more often. The reason? All forms of electronic communication serve to bring work across my desk faster than ever before, and the people I work with expect immediate follow-up. Certainly a personal computer allows me to be more productive, but the partners and managers at my firm have merely adjusted their expectations accordingly (pp.13)."

The absence of an equitable and appropriate reward to the individual can consequently lead to negative impact on the auditor’s activation level, affect his satisfaction and thus lower their expected conditional value or worse yet lead to the ultimate exit of such individuals.

Another concern for organizations is the greater mobility of workers with computer acquired skills and knowledge. This is especially true if an individual believes that his role or skills command a higher value elsewhere.

Thus, unless rewards commensurate with the skills and role changes of the employee, organizations may suffer high turnover and not reap the benefits of IT invested due to the loss of valuable human resource.

**Assessing IT Benefits**

To assess the benefits of IT introduced to knowledge workers such as to the external auditors, we could measure such variables exposed in the Flammholz model and discussed above, prior to and after the introduction of IT. This framework could also be used as a basis for monitoring and improving the management of IT invested by analyzing the changes or shifts in these variables over time.

For non-monetary measures of skills, activation level, roles, rewards, and satisfaction, 7-point Likert scale questionnaire can be used. Validated instruments, such as Minnesota Satisfaction Questionnaire (MSQ) or the Michigan Organizational Assessment Questionnaire (MOAQ) for tapping job satisfaction and perceptions on tasks, roles and rewards may be borrowed where applicable.

**CONCLUSION**

Using the HRA paradigm to assess the value of IT offers a new approach towards measuring the benefit of IT investments. Particularly in the knowledge work domains where the major asset to the firm is the individual knowledge worker, the application of HRA model is most appropriate.

In our discussion, we have focused heavily on the theoretical model espoused by Flammholz. Although there have been criticism about the model, we believe that they do not invalidate our above analysis. Instead, we believe that because of the many intangible outcomes that can accrue to the firm from the introduction and use of IT, the use of the non-monetary Flammholz model designed to assess such intangibles can better capture such outcomes. Also, the model can be a useful tool in assessing the impacts and thus the value of IT on the individual knowledge worker by measuring the changes to the variables in the model. A longitudinal study on employees of some of the "big six" firms is now under way to generate and validate some postulations regarding the variables in the Flammholz model. With subsequent empirical support, we hope to show that using HRA to value IT investments not only has a strong theoretical base, but presents a practical approach towards analyzing IT investment payoffs.

**REFERENCES**


