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Information System and its implications on organizational performance: Human Resource as the key Efficiency Determinant

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Abstract: Information System aims to provide accessible and understandable information that is reliable and complete for the users of the system in a timely manner. Key Efficiency Determinants for Information System (IS) are classified into three major categories i.e. Human Resource (HR) such as Information System Personnel Skills & Information System Human Resource Specialty; IT Infrastructure Flexibility such as platform, network, data & applications sophistications; and Effective Relationship such as the relationship of IS unit with vendors and service providers. Amongst those human resource plays an important role as from decision makers to the operational level humans play the major role to interact with the Information Systems. It was found that most important efficiency determinant for IS is Human Resource (HR) that is responsible to operate and manage IS. Currently the commercial banks in Pakistan are investing a handsome capital for IT to make their information systems efficient as the banks can operate their processes effectively and provide the better online services to their clients. This research is based on empirical study of commercial banking sector in Pakistan, which will evaluate the Information System in the context of organizational performance for this we have taken a case study of the commercial banks operating in Sindh Pakistan. However, we have covered other determinants also in our overall research but in this paper we are emphasizing the HR as the backbone of the computer and human interaction and of the human resources available at the banking sector. The overall findings would play an important role according to the objectives of the information systems to make Information Systems working better for the organizations.

Keywords: Information Systems, Key Efficiency determinants, Human Resource.

I. INTRODUCTION

Information is a set of data converted in such a manner that it helps in the process of decision making by decreasing future uncertainty. Information is data converted in a manner that is sensible for the receiver; in other words, when a person makes or perform a decision, it provides him or her an actual or perceived value (Gómez, *et al.*, 2010). (Din, *et al.*, 2017). (Laudon. and Laudon, 2010) (Víctor *et al.*, 2014). Information System (IS) is an Information Technology (IT) based system, which has a significant impact on the operations of the organization and ultimately the operating efficiency of the IS causes to enhance the firm performance (Davenport, 1998).

Since the advent of the first computer, information systems have been introduced in companies as an essential and powerful tool to enhance and optimize management activities. Because of the systems progress in each particular area and due to the technology accessibility over time, their incorporation has been progressive (Gómez, *et al.*, 2010). (Laudon. and Laudon, 2010).

There are four main activities of Human Resource (HR) function – educating and training, termination and profit administration, recruiting and hiring, and managing employee-related information. An Information System used to manage the information regarding the personnel of an organization is known as Human Resource Information System (HRIS) [ref]. In few organizations HRIS is considered as a component of another subsystem like accounting IS. HRIS in general is responsible to provide the reports containing the useful information to the HR Director. All sorts of data professionals and managers are included in the personnel inside HRIS. Three input subsystems are contained within the model of HRIS; Human Resources Intelligence (HRI), Human Resources Research (HRR) and the Accounting Information System (AIS). Personnel information that is communicated in financial terms is provided by the AIS. Along with the employees' data, the HRIS database consists the information regarding the environment of the organization that has a significant influence on HR personnel. Many organizations are using mainframe-based Database Management Systems (DBMS) to maintain the transactions of HRIS. The output produced by HRIS is mostly available through database inquiries and scheduled/routine reports which can be used as the input for expert systems as well as mathematical models. Along with prewritten, the custom software is also used to develop the outputs while widely used custom software are considered as a collective effort of both HR and IS (Din, *et al.*, 2017).

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In many organizations there are three levels: Operational, Tactical and Strategic. The activities performed show a variation from one level to another. In order to be effective, managers must possess an attitude that imitates that both theory and situational factors are beneficial under some conditions; have the necessary abilities for examining, recognizing and correcting complex problems;

Currently, the commercial banks in Pakistan are investing a handsome capital for Information Technology (IT) to make their information systems (IS) efficient as the banks can operate their processes effectively and provide the better online services to their clients.

This paper provides the historical perspective of information system followed by IS core concepts and definitions. After that, the role of IS in business and technology is mentioned from both perspective Global and Local (i.e. Pakistan). Further, general IS models for business enterprises are discussed as well as information systems at different levels are elaborated. E-Business Information System along with Ethical and Social Issues in Information System are also described in this paper. Also, some essential measures which are useful to determine the efficiency of information system have been elaborated. In the last of thepaper, problem statement has been formulated along with objectives and hypotheses for this study, followed by the conceptual model and analysis.

2. MANAGEMENT INFORMATION SYSTEM (MIS)

MIS is a particular group of information systems which, by providing the useful information to the middle-level managers, makes them enable to monitor, control, and administer, and decision-making activities.

A. Decision Support Systems

DSS make use of internal data from MIS and TPS, they frequently bring in information from exterior sources, like product values of competitors or present stock values. Business analysts who intend to utilize the complex/sophisticated models in order to analyze data, employ these systems (Laudon. and Laudon, 2010).

B. Executive Support Systems

Executive support systems (ESS) support senior management in making decisions. As there is no agreed-on process for reaching at a solution, so they address non-routine decisions needing insight, evaluation and judgement. From numerous sources, ESS represent data and graphs through an interface that remains easy to use for senior managers.

C. E-business Information Systems

E-business information system transmutes organization's relationships with suppliers, logistic partners, employees and customers into digital relationship using internet and the networks. More conclusively, through the use of electronic business, majority of the processes in the enterprise are being implemented through the proper use of digital technology and internet.

The proficiency of Information System is measured from diverse dimensions, for example user satisfaction, use, organizational impact, intention to use, individual impact, system quality, service quality and information quality

1) System Quality

System Quality refers the study of a system from technical aspects, counting flexibility, navigation ease, sophistication, response time, reliability, system functionality and convenience of access, among others

2) Information Quality

Quality information are assumed to be produced through information systems. Quality of the information can be measured through the characteristics like conciseness, timeliness, understandability, sufficiency, appropriateness, currency, accuracy, precision.

3) Service Quality

System Quality refers to the quality of all the services rendered by the personnel of IS department to the end-user of the organization.

4) User Satisfaction

From various dimensions the end-users are using the information systems which must be efficient in their operations.

These determinants are also useful while matching different sections of an organization with each other. Performance of different sections can be observed by matching different operating sections and proposes measurements through which the efficiency of the operations can be examined.

The discovery of key efficiency determinants of information system like human resource, information system flexibility, and IS personnel effective relationship followed by different aspects of IS operating efficiency e.g. system quality, information quality, service quality and intention to use. After that, the use of Information Systems in commercial banks is determined.

IS human resource is being well-defined by two significant constructs: IS human resource specificity and IS personnel skills. Skills of IS personnel determine the level at which IS personnel having technological, business, interpersonal and managerial skills.

(Coff and Russell in 1997) have presented Resource based scholars contend that human resources can be a wellspring of manageable favorable position in light of the fact that unsaid information and quality are difficult to copy. These alluring traits cause situations that may keep firms from creating favorable position. This article builds up a structure for breaking down and adapting to these difficulties. In spite of the fact, the issue emerges from the procedure writing. The arrangements are drawn from the authoritative conduct. Professional Literature (LP), human capital (Davenport, 1998).

Human capital includes IS Personnel who have an important input in the development and operations of IS. Toperform IS tasks effectively, technical knowledge and firm specific knowledge is very much needed. (Lertwongsatien, 2005)

The researcher describes end-user Information System Capability (ISC) as an important tool to measure the efficiency of the firm's strategic areas including organizational planning, product and market development, human resources production and operations, (John *et al.,* 2013).

3. RELATED WORK

The efficiency of Information System greatly hinges on the input-factors which serve as key determinants and subsequently derive its efficiency to lower or higher operational point. However the past research studies have cited multiple antecedents (attributed to technical, operational, infrastructural, human related) for efficiency of a given Information System (Luftman, *et al.,* 2017). Of those antecedents, some have been found more relevant such as factors related to HR identified by (Chuang, *et al.,* 2017) and in other cases factors related to Information Technology infrastructure flexibility have been found to be more efficient drivers (Sellers, *et al.,* 2017).

In case of Pakistan, there is no much academic consensus on which factors happened to be important efficient drivers since the efficiency determinants for IS have been relatively unexplored in the commercial banking sector particularly in Pakistan. This is an effort to fill that gap by identifying the Key Efficiency Determinants **(KEDs)** for an information system in banking sector, and to investigate the implications of information system on the operating as well as market-based performance of the commercial banks, through an empirical study of commercial banking sector operating in Sindh Pakistan.

4. MODEL

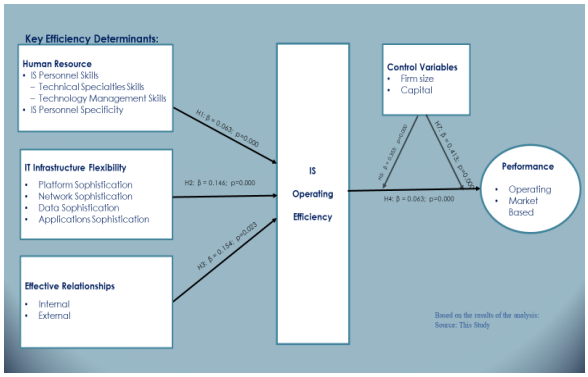

Fig. 1. The Conceptual Framework Model

In the conceptual framework, *Human Resource*, *Information Technology Infrastructure Flexibility* and *Effective Relationship* are shown as the Independent Variables and the *Information SystemOperating Efficiency* is shown as the Dependent Variable. It means the efficiency of the information systems depends upon the Independent Variables as shown in **Error! Reference source not found.**. In this paper we emphasize more on the Human Resource determinants that deals with the Information System Personnel Skills i.e. Technical Specialties Skills and Technology Management Skills and Information System Personnel Specificity that points to the Information System Operating Efficiency hence the Performance of the Organization.

5. MATHEMATICAL EQUATION

$$ISOE_{it} = f(HR_{it}, ITIF_{it}, ER_{it})$$

where

ISOE denotes Information System Operating Efficiency, *HR* denotes Human Resource, *ITF* denotes Technology Flexibility, *ER* denotes Effective Relationship, *i* means Individual Commercial Bank and *t* means specific time period.

In the framework Information System Operating Efficiency is shown as the independent variable and the performance of the organization is based on that independent variable along with three control variables.

In this study, organization size, organization age, and capital will be used as control variables.

$$Prf_{it} = f(ISOE_{it}, FS_{(c)it}, FA_{(c)it}, CP_{(c)it})$$

where

Prf denotes Performance, *FS* denotes Firm Size, *FA*denotes Firm Age, *CA* denotes Firm Capital, *i means* Individual and specifies given time period

6. HYPOTHESIS

H1. IS Human Resource have a positive impact on IS operating efficiency of commercial banks

H2. IS IT Infrastructure Flexibility has a positive impact on IS operating efficiency of commercial banks

H3. IS Effective Relationships have a positive impact on IS operating efficiency of commercial banks

H4. IS operating efficiency is positively related with the performance of commercial banks

H5. Organization size significantly controls the relationship between IS operating efficiency and performance of commercial banks.

H6. Organization age significantly controls the relationship between IS operating efficiency and performance of commercial banks.

H7. The volume of organization capital significantly controls the relationship between IS operating efficiency and performance of commercial banks.

7. ANALYSIS AND RESULTS

Prior to detailed analysis, the validity and reliability of the scales have been determined.

a. Validity Statistics

The validity of scale shows that a scale truly measures for the purpose it has been constructed. Items of scales for each construct were combined to assess their convergent and discriminant validity.

b. Convergent Validity

Convergent validity is the measurement to gauge the degree of correlation of several items under the same construct of the domain.

With an automated Human Resource Information System the organization will be able to make decisions faster that are of informed and cut their operational costs. From **(Fig. 2 to Fig. 7)** the demography factors of the Respondents are shown according to their Gender, Qualification, Designation, Age, Professional Experience and Organizations, respectively.

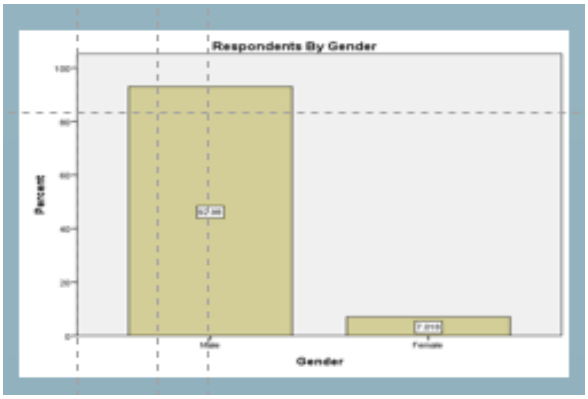

Fig. 2 Respondents according to their Gender

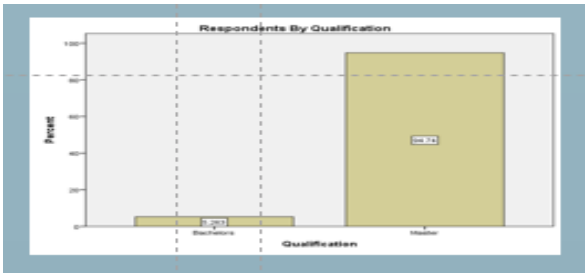

Fig. 3 Respondents according to their Qualification

Fig. 4 Respondents according to their Designation

Human Resource professionals' mostly spend their time in administrative tasks e.g. employees' time log which takes a big chunk of his/her time in making time-log spreadsheets.

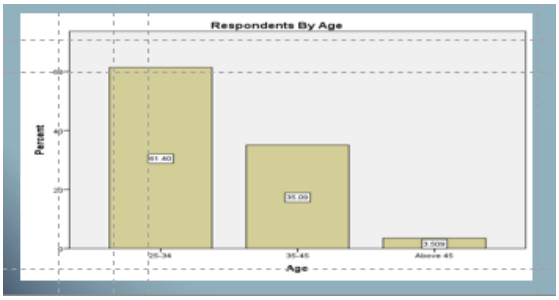

Fig. 5 Respondents shown by their Age

As the organization grows so the needs of employees on the information systems hence it would be difficult to do it manually. The information systems makes it easy to go through reports, track record of getting leaves, feedback about the performance with the relevant department.

Fig. 6 Respondents according to their Professional Experience

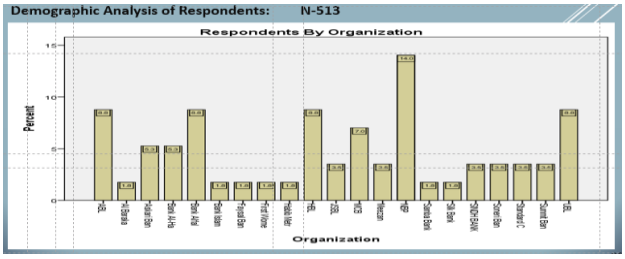

Fig. 7 Respondents by Organization

Validity test: Discriminant Validity (Hox, *et al.*, 2017). (Fornell-Larcker Criterion) is shown in **(Table 1).** Since all bold values are shown in tableare below 0.5, therefore all measurement scales used in this survey are showing discriminant validity.

Table 1 Validity Test -Discriminant Validity (Fornell-Larcker Criterion)

	Effective Relations	Human Resource	IS Efficiency	IT Infrastructure	Performance
Effective Relations	**0.908**				
Human Resource	0.060	**0.829**			
IS Efficiency	-0.073	-0.066	**0.840**		
IT Infrastructure	0.329	-0.002	0.253	**0.897**	
Performance	0.085	-0.062	0.349	0.648	**0.880**

Values in the bold are Square root of AVE

(Table 2) depicts the Validity Test for Cross Loadings of items for Human Resource Construct.

Table 2 Validity Test - Cross Loadings of items for Human Resource Construct

ITEM	Technical Specialties skills	Technology Management Skills	IS Personnel Specificity
TSS1	0.607		
TSS2	0.560		
TSS3	0.862		
TSS4	0.851		
TSS5	0.513		
TSS6	0.625		
TSS7	0.768		
TSS8	0.592		
TSS9	0.518		
TSS10	0.614		
TSS11	0.877		
TSS12	0.737		
TSS13	0.634		
TSS14	0.562		
TSS15	0.507		
TSS16	0.660		
TSS17	0.862		
TSS18	0.751		
TSS19	0.570		
TMS1		0.714	
TMS2		0.517	
TMS3		0.805	
TMS4		0.562	
ISPS1			0.643
ISPS2			0.824
ISPS3			0.803
ISPS4			0.592
ISPS5			0.528
ISPS6			0.654
ISPS7			0.748

Table 3Reliability Test, (Cronbach's Alpha, rho A and Composite Reliability)

VARIABLES	Cronbach's Alpha	rho_A	Composite Reliability
Effective Relations	0.807	0.848	0.904
Human Resource	0.826	0.897	0.868
IS Efficiency	0.792	0.815	0.878
IT Infrastructure	0.920	0.941	0.943
Performance	0.709	0.711	0.873

(Table 4) shows the Descriptive Statistics of Independent and Dependent Variables whereas the Table 3 mentions the Reliability Test (i.e. Cronbach's Alpha, rho A and Composite Reliability).

Table 4 Descriptive Statistics of Independent and Dependent Variables

Variables	N	Mean	Std. Deviation
Human Resource	513	3.8434	.30677
IT Infrastructure Flexibility	513	3.6395	.34618
Effective Relationships	513	3.4251	.54791
IS Operating Efficiency	513	3.8596	.58945
Organizational Performance	513	3.8121	.65797
Valid N (listwise)	513		

Information Systems help decentralize work environment by not depending upon the geographic location or place from where the system is dealt with rather the efficiency to get job done in time with quality.

Table 5 Descriptive Statistics in break-up of Sub-constructs for each construct

Descriptive Statistics in break-up of Sub-Constructs for each Construct/Variable

Sub-Constructs	N	Mean	Std. Deviation
Technical Specialties Skills	513	3.5383	.47666
Technology Management Skills	513	3.9518	.42560
IS Personnel Specificity	513	4.0401	.38235
Platform Sophistication	513	3.8099	.50140
Network Sophistication	513	3.7789	.64045
Data Sophistication	513	3.5395	.50222
Application Sophistication	513	3.4298	.64571
Effective Relationship: Internal	513	3.6296	.50532
Effective Relationship: External	513	3.2206	.67022
IS Operating Efficiency	513	3.8596	.58945
Market-based Performance	513	3.8465	.78682
Operating Performance	513	3.7778	.70803
Valid N (listwise)	513		

(Table 5) shows the Descriptive Statistics in break-up of Sub-constructs for each construct. Information System stores data in digital format, shares the files in private with the coworkers and this all is done with few commands or clicks.

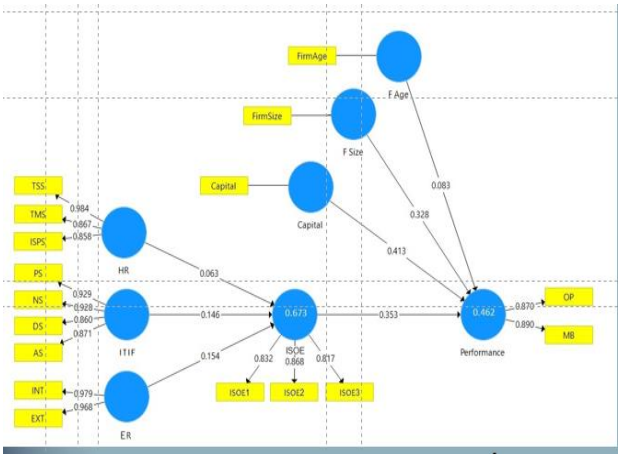

Fig. 8 Structural Equation Model Results Path Coefficients and R^2

Table 6 clarifies the Summary of Structural Equation Model (SEM), Path Coefficients, R^2, Q^2, T-Statistics and P-Value. However, Fig. 8 shows the Structural Equation Model Results Path Coefficients and R^2.

Table 6 Summary of Structural Equation Model (SEM), Path Coefficients, R^2, Q^2, T-Statistics and P-Value

Hypothetical Constructs	Path Coefficients	T Statistics (|O/STDEV|)	P Values
HR -> IS Operating Efficiency	** 0.063	6.013	0.000
ITIF -> IS Operating Efficiency	** 0.146	8.385	0.000
ER -> IS Operating Efficiency	* 0.154	2.276	0.023
R^2= 0.673;	Q^2= 0.436		
ISOE -> Org. Performance	** 0.353	5.164	0.000
F Age -> Org. Performance	0.083	1.093	0.274
F Size -> Org. Performance	** 0.328	6.071	0.000
Capital -> Performance	** 0.413	9.574	0.000
R^2= 0.462;	Q^2= 0.304		

* Significant at 95% confidence level
** Significant at 99% confidence level

According to the Empirical test evidence of the Hypothesis for HR, it is assessed that:

H1 IS Human Resource have a positive impact on IS operating efficiency of commercial banks. ($^*\beta$ = 0.063; $p < 0.01$)

H5 Organization size significantly controls the relationship between IS operating efficiency and performance of commercial banks. ($^*\beta$ =0.328; $p< 0.01$)

H6 Organization age significantly controls the relationship between IS operating efficiency and performance of commercial banks. ($^*\beta$=0.083; $p > 0.05$)

H7 The volume of organization capital significantly controls the relationship between IS operating efficiency and performance of commercial banks. ($^*\beta$ = 0.413; $p < 0.01$)

Firstly it is recommended that commercial banks should make a good investment on training of IS personnel to improve TMS (such as learn and apply new technologies etc.) since these category-skills have been considered more relevant in driving efficiency of IS. Through improving IS personnel skills, commercial banks can drive the efficiency of IS from medium to high level operational point. For effective relationships, it is found that there lacks a network of supporting relationships among key internal and external stakeholders which have been considered important in achieving synergic efficiency of IS. It is also recommended that commercial banks should improve the relationships among its internal parties (such as operational staff and managers working in various business units) and its external parties (such as IT vendors, government institutes and community bodies) in order to build a well-knitted network of relationships based on trust, transparency, and mutual interests.

8. CONCLUSION

Human resource as a key efficiency determinants provide inspiration, motivation, and creativity that is of utter importance. The main research objective was to identify the key efficiency determinants for an IS in commercial banks of Sindh Pakistan. Other objectives included were the role and impact of ISOE on OP with the incorporation of major control variables. A dynamic conceptual framework was developed indicating the relationship of three key efficiency determinants (i.e. HR, ITIF and ER) with ISOE. Before calculation of descriptive statistics and SEM analysis, the collected data was checked for its validity through the application of convergent validity AVE and discriminant validity fornell-Larcker criterion and HTMT. The size of commercial banks are growing, they accumulate more expertise and consequently the impact of ISOE is magnified on their performance. Same conclusion is made for capital as a control variable which narrates that the bigger commercial banks' capital, the higher impact of ISOE would be on its performance. The third control variable was found statistical insignificant as its p-value is well above the cut-of value of 0.05. Though age control variable is found to be insignificant in this model but its importance cannot be ruled out therefore more research is needed to have a conclusive opinion on this important variable. Finally, on the basis of findings it is recommended that all other economic stake holders should invest in Human Resource, IT infrastructure and relationship networking resources linked to the efficiency enhancement of the IS.

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