# The Impact of Management Information Systems' Effectiveness on Task Productivity the Case of the Greek Banking Sector

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*Abstract*—**Management of information technology plays a strategic role in building a competitive advantage, particularly in the banking sector which is based on reliability and information. This paper investigates the impact of Management Information Systems (MIS) effectiveness on task productivity. The Competing Value Model (CVM) was adopted for the operationalization of MIS effectiveness, which defines four archetypes labeled as: open system (OS), human relations (HR), internal process (IP) and rational model (RM). The empirical findings from a survey of 186 employees in Greece revealed that a) the externally focused MIS effectiveness archetypes (OS, RM) reflecting innovation, creativity, goal setting and planning enhance task productivity b) the IP model of MIS effectiveness influences negatively task productivity.**

*Index Terms*— **Banking, MIS effectiveness, competing values framework, task productivity.**

## I. INTRODUCTION

In this turbulent era, organizations strive to improve their competitiveness by enhancing productivity, innovation, quality and flexibility of services at the individual and organizational levels [1],[2]. Under this pressure, the organization's information processing capabilities are challenged by additional and diverse demands, such as speed and reliability. In order to address this strategic challenge, organizations develop and apply more sophisticated and comprehensive MISs [3], [4].

Organizational behavior literature has put special emphasis on studying information systems (IS) effectiveness for many years. Even though the impact of MIS on performance is widely recognized, prior research on their direct and indirect association concludes to rather mixed and confused results [5],[6].

Among the various benefits of MIS effectiveness, the role of work outcomes has been acknowledged. MISs provide managers with a broad range of information about multiple dimensions of the firm's operations [3],[5], thus supporting decision-making and performance achievement [1],[7],[8] and facilitating the work of end users. Focusing on the banking sector, organizations suffer from achieving different levels of MIS effectiveness, leading to different levels of work outcomes, such as productivity.

This paper aims to investigate the impact of different MIS effectiveness dimensions on task productivity.

After this introductory section MIS effectiveness built on the CVM is being reviewed. This is followed by a presentation of the research methodology including the questionnaire design and sampling. Statistical analyses and results are following and at the end, conclusions and recommendation for the future are discussed.

## II. MANAGEMENT INFORMATION SYSTEMS EFFECTIVENESS

The management of information technology plays a crucial role, especially in service sectors such as banking, which they build their competitive advantage on credibility and information. Vast amount of capital has been invested on information systems, with MIS making up a substantial portion of this expenditure [9].

Despite the absence of consensus on a standard definition of MIS in information systems literature, Davis and Olsen [10] have suggested a commonly cited definition, according to which MIS is "an integrated, user machine system providing the necessary information to support  core functions of the firm such as operations, management, and decision making". These systems typically utilize computer software and hardware, manual procedures, models for analysis, planning control, decision making and a database.

MIS evaluation has been put at the top of the agenda of both academics and managers, particularly in the current turbulent era of economic crisis. Despite the fact that MIS efficiency is relatively easy to define and measure, it is much more difficult to adequately operationalize MIS effectiveness. Moreover, the lack of a relevant theory and the discord on a definition of MIS effectiveness exacerbate confusion and vagueness [9].

This leads to an examination of the organizational effectiveness literature in order to define MIS effectiveness. Unfortunately, there is no consensus on a universally accepted organizational effectiveness theory, because of the inherently high-level abstraction of this concept.

The competing values model (CVM) developed by Quinn and Rohrbaugh [11] was proposed originally to clarify and measure organizational effectiveness. This approach was the result of a multidimensional scaling analysis that identified four distinct models clustering judgments of organizational researchers and theorists about the relative similarity of 16 commonly used criteria of organizational performance.

The CVM approach has been selected in this study because

it was qualified as the most suitable basis to develop the MIS effectiveness construct, as it covers multiple performance criteria. CVM shares wider acceptance among academics as it has been validated by an increasing number of researchers not only as a model of organizational effectiveness, but also as a measurement instrument for other organizational phenomena such as MIS effectiveness [12], organizational culture [13] and leadership [14]. CVM has also been utilized as a device for mapping organizations' profiles and conducting comparative analysis [15]. Furthermore, CVM provides a set of tools and techniques to practitioners in order to develop and sustain more desirable profiles of effectiveness.

CVM emphasizes the competing tensions and conflicts across two primary axes, which form a four quadrant model. The first axis extends from flexibility and change to control and order. The second reflects the conflict between the internal focus and external focus. Thus, the intersection of these two dimensions defines the following four models or archetypes: open system, human relations, internal process and rational.

Exploring the inertial impact of organizational culture on IT implementation, Cooper [12] developed an instrument based on CVM, for the measurement of MIS effectiveness (Fig. 1). This construct is founded on distinctive criteria in relation to the varying capabilities of different MIS types, as interpreted by an in-depth examination provided by academics and MIS experts. A multidimensional scaling technique was applied to derive the MIS experts' perceptions mapping and to confirm the clustering of MIS attributes on the following four quadrants proposed by CVM:

*Open system* model is linked with creativity, entrepreneurship, adaptability and external orientations. *Human relations* model is characterized by flexibility, morale, teamwork and participation values. *Internal process* model is marked by stability, order and internal orientations. *Rational goal* model is focused on organizational planning, directing, goal setting and external orientation.

In the present study, our objective is the investigation of the impact of MIS effectiveness on task productivity. It is expected that each MIS effectiveness archetype will be associated with specific work outcomes which reflect characteristics of the relative archetype. For example, stability (internal process) and goals setting (rational) models will be related to task productivity.

## III. METHODOLOGY

### A. Questionnaire Design

The field research was based on a structured questionnaire. It was built by adapting existing scales in the managerial literature measuring MIS effectiveness and aspects of work outcomes.

Cooper [12] in his investigation of the impact of culture and effectiveness on MIS, developed a survey instrument based on CVM, which measures MIS effectiveness. A number of researchers have elaborated this construct and confirmed its validity [16].

A review of past research on the impact of IT on work reveals that there have been variations in measuring work in organizations. For the purpose of comprehensively capturing the aspects of the perceived IT impact on work, this study adopts the construct of Doll and Torkzadeh, [17] for measuring task productivity, which have been conceptualized and used in previous empirical studies [1].

The answers to the aforementioned constructs were specified in a seven-point Likert scale.

The research instrument was tested twice before it was released. Firstly, it was examined by one branch executive from twelve different bank branches (three from small, three from medium and three from large banks). Secondly, it was handed to academics for in depth discussions. This process was fruitful, since they confirmed the cognitive relevance of the questionnaire to banks.

### B. Sampling

The field research was conducted using a structured questionnaire in a cross-sectional sample of banks in Athens. Athens is the capital of Greece and it has approximately 4,500,000 inhabitants. The field research was focused on the banking sector, since MIS systems are considered as the foundation of their core information competence to build their competitive advantage.

Sixteen (16) different banks and forty two (42) bank branches participated in the survey. The survey respondents's selection was based on their affiliation to MIS, regardless of their hierarchical position, in order to ensure a level of MIS effectiveness awareness. From the initial sample of 400 employees, 186 valid questionnaires were gathered, thus achieving a response rate of 46.5%, which is considered to be satisfactory for this type of empirical research.

The 27% of the sample were small banks, 23% medium and 50% large. The 60% of the respondents were males. The 34% of the respondents aged between 25 and 35 years old and 29% were between 36 and 45. The 34.4% of the sample had working experience between 6 and 10 years and 30.1% had more than 20 years of experience. The demographics of our sample converge with other studies in the banking sector, in the city of Athens [18].

## IV. RESULTS

### A. Principal Component Analysis

Principal Component Analysis (PCA) with normalized varimax rotation was performed and four factors were extracted from the MIS effectiveness scale, which they accounted for over 76% of the total variation. The four distinct principal components that were identified, correspond to: (a) Open System, (b) Human relations, (c) Internal Process and (d) Rational Goal models.

The Open System dimension of MIS effectiveness consisted of items referring to environmental scanning and filtering, inter-organizational linking, doubt and argument promoting. The Human Relations issues of MIS comprised items referring to interpersonal communicating and conferencing, group decision supporting, and personalized systems. The Internal Process dimension consisted of items referring to internal monitoring, internal controlling, record

keeping, optimizing, precision and reliable systems. The Rational Goal model dimension embraced items such as modeling, forecasting, sensitivity analysis and integrated systems.

TABLE I: THE ARRANGEMENT OF CHANNELS DESCRIPTIVE STATISTICS AND RELIABILITY ANALYSIS

| Channels | mean | S.D. | Cronbach's alpha | Items | KMO[a] |
|---|---|---|---|---|---|
| OS | 4.10 | 1.369 | 0.905 | 4 | 0.928 |
| HR | 4.23 | 1.291 | 0.853 | 4 | |
| IP | 4.99 | 1.114 | 0.926 | 6 | |
| RM | 4.40 | 1.187 | 0.923 | 6 | |
| Task productivity | 5.11 | 0.984 | 0.837 | 3 | 0.910 |

The Kaiser–Meyer–Olkin (KMO) indicator was calculated to assess sample size adequacy. The minimum acceptable level is 0.5. Bartlett's test of sphericity is significant at $p<0.001$ for all scales. Valid N=186.

One principal component was extracted (Kaizer criterion), explaining approximately 77% of the overall variance for the task productivity scale.

Preceding PCA, the Bartlett sphericity testing on the degree of correlation between the variables ($p<0.001$) and the Kaiser–Meyer–Olkin (KMO) index verified the appropriateness of the sample. Cronbach's coefficient alpha was calculated to test internal reliability of each scale, as recommended by Nunnally and Bernstein [19]. All sub-scales exhibited well over the minimum acceptable reliability level of 0.7. Table I presents descriptive statistics, number of items and reliability analysis indices of all scales.

### B. Multiple Regression Analysis

Four control variables were included in the analyses namely gender, age, education, and working experience. Results indicate that MIS effectiveness related significantly to task productivity, since the 16.4% of the total variance of the dependent variable is explained.

TABLE II: RESULTS OF MULTIPLE REGRESSION ANALYSES

| | Task Productivity [a] |
|---|---|
| **Control Variables** | |
| Gender | -0.074 |
| Age | -0.067 |
| Education | 0.184* |
| Experience | 0.267* |
| **MIS Patterns** | |
| OS | 0.268* |
| HR | -0.041 |
| IP | -0.314** |
| RM | 0.333** |
| Adjusted R square | 0.164*** |

[a] Standardized beta, Significant at * $p<0.05$; ** $p<0.01$; *** $p<0.001$

No serious problems of multi-collinearity exist between the independent variables as Variance Inflation Factors (VIF) are far below the 3 points limit suggested in Social Sciences literature. The results of regression analyses (standardized betas, adjusted R square, significance levels) are exhibited in Table II. The data were examined for outliers, skewness, kurtosis, and multivariate normality.

The values of standardized betas reveal that the MIS effectiveness dimension reflecting the open system model is significantly and positively linked with task productivity (std. beta=0.268, $p<0.05$). The internal process pattern of MIS effectiveness is strongly and negatively associated with task productivity (std. beta=-0.314, $p<0.01$). Lastly, the rational model dimension of MIS effectiveness is the most influential predictor of task productivity (std. beta=0.333, $p<0.01$).

Regarding control variables, working experience and education level are strongly associated with task productivity.

## V. DISCUSSION AND CONCLUSIONS

The aim of the present study was to examine the perceived impact of four MIS effectiveness archetypes (open system, human relations, internal process and rational) on task productivity, by providing empirical evidence from banks in Greece.

It was hypothesized that each MIS dimension will exert positive effects on specific work outcomes, which reflect characteristics or traits of the relative archetype. Thus, the rational model, which is focused on planning, directing, goal setting and external orientation, is the dominant dimension influencing task productivity.

Given that stability, control, order and internal orientations are key ingredients of the internal process model of MIS effectiveness, it exerts a negative impact on the external oriented work metric of task innovation.

Interestingly, internal process model characterised by stability, control, order and internal orientations, is negatively associated with task productivity, as opposed to what expected. The logic behind this finding is that the MIS capabilities of documentation and tight control impose employees with work overload and bureaucracy, often strangling productivity.

The main implication of the findings for bank managers and information systems' practitioners is that they have to design and implement MIS built on the relevant effectiveness dimensions; those are MIS capabilities supporting innovativeness, creativity and environment scanning (open system) as well as modelling, optimizing and forecasting (rational) at the expense of internal controlling, monitoring, excessive documentation and stability (internal process).

### REFERENCES

[1] D. Naranjo-Gil, "Management information systems and strategic performances: The role of top team composition," *Int. J. Inform Manage,* vol. 29, 2009, pp. 104–110.

[2] X. Deng, W. J. Doll, and M. Cao, "Exploring the absorptive capacity to innovation/productivity link for individual engineers engaged in IT enabled work," *Inform. Manage*, vol. 45, 2008, pp. 75–87.

[3] J. M. Choe, "The relationships among performance of accounting information systems, influence factors and evolution level of information systems," *J. Manag. Inform. Syst.*, vol. 12, no. 4, March 1996, pp. 215–239.

[4] K. E. Ghorab, "The impact of technology acceptance considerations on system usage, and adopted level of technological sophistication: An empirical investigation," *Int. J. Inform Manage*, vol. 17, no. 4, 1997, pp. 249–259.

[5] J. M. Choe, "The consideration of cultural differences in the design of information systems," *Inform. Manage,* vol. 41, 2004, pp. 669–684.

[6] N. Fuller-Love and J. Cooper, "Competition or co-operation? Strategic information management in the national health service: A case study of the Ceredigion NHS trust," *Int. J. Inform Manage*, vol. 16, no. 3, 1996, pp. 219–232.

[7] R. S. Kaplan and D. S. Norton, "Using the scorecard as a strategic management system," *Harvard Bus. Rev.*, Jan.-Feb. 1996, pp. 75–85.

[8] E. Kim and J. Lee, "An exploratory contingency model of user participation and MIS use," *Inform. Manage*, vol. 11, 1986, pp. 87–97.

[9] R. B. Cooper and R. E. Quinn, "Implications of the Competing Values Framework for Management Information Systems," *Hum. Resour. Man*, vol. 32, no. 1, 1993, pp. 175–201.

[10] G. B. Davis and M. H. Olsen, "Management Information Systems: Conceptual Foundations," *Structure and Development*, McGraw-Hill, New York, NY, 1985.

[11] R. E. Quinn and J. Rohrbaugh, "A Spatial Model of Effectiveness Criteria: Towards a Competing Values Approach to Organizational Analysis," *Manag. Sci.*, vol. 29, no. 3, 1983, pp. 363–77.

[12] R. Cooper "The inertial impact of culture on IT implementation," *Inform. Manage*, vol. 27, 1994, pp. 17-31.

[13] L. W. Howard, "Validating the competing values model as a representation of organizational cultures," *Int. J. Organ. Anal.*, vol. 6, no. 3, 1998, pp. 231-250.

[14] S. Hart and R. E. Quinn, "Roles Executives Play: Behavioral Complexity and Firm Performance," *Hum.Relat.*, vol. 46, no. 5, 1993, pp. 543–74.

[15] R. E. Quinn and K. S. Cameron, "Organizational life cycles and shifting criteria and effectiveness," *Manag. Sci.*, vol. 9, 1983, pp. 33-51.

[16] P. Trivellas, P. Reklitis, and I. Santouridis, "Culture and MIS effectiveness Patterns in a Quality Context: A case study in Greece," *Int. J. Know. Culture and Change Manag.*, vol. 6, no. 3, 2006, pp 129-144.

[17] W. J. Doll and G. Torkzadeh, "Developing a multidimensional measure of system-use in an organizational context," *Inform. Manage*, vol. 33, 1998, pp.171-85.

[18] C. Lymperopoulos and E. Chaniotakis, "Factors affecting acceptance of the Internet as a Marketing-Intelligence tool among employees of Greek bank branches," *Int. J. Bank Market*, 2005, vol. 23, no. 6, pp. 484-505.

[19] J. C., Nunnally and I. H. Bernstein, *Psychometric Theory*, 3rd edition. McGraw-Hill, New York, 1994.

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