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Information Quality, Reporting and Organisational Performance

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Abstract

This study aims at the exploration of the statistical relationship between the quality of the Information produced by Information Systems (IS) such as ERPs and Organisational Performance. The definition of information quality encompasses measures such as accuracy, precision, currency, timeliness, conciseness, which aim at providing decision tools to the users of any Information System. Producing quality information/reports is the primary purpose of any IS. The results from a survey on 168 Greek companies show a strong correlation between Information Quality and Organisational Performance when this is expressed by financial and not financial measures.

Keywords: Organisational Performance, Information System effectiveness, ERP systems

Information Systems Success

The most popular definition for IS success is “the extent to which a specific Information System actually contributes to achieving organisational goals, i.e. its effect on organisational performance” (Hamilton & Chervany, 1981) which is the basic research objective of this paper. Despite the extensive research and managerial effort to understand the underlying factors, the IS failure rate remains high as recently argued in the pertinent literature (Dwivedi et al., 2015).

There are several recent and older publications reporting successful as well as unsuccessful IS implementations, at an organisational level, which makes the impact of Information Systems one of the most prominent streams in IS research. Hendricks et al. (2007) for example explored the effect of investments in Enterprise Resource Planning (ERP), Supply Chain Management (SCM), and Customer Relationship Management
(CRM) systems on a firm's long-term stock price performance and profitability measures such as return on assets and return on sales. The results showed that ERP implementations had improvements in profitability but not in stock returns whereas adopters of SCM systems experienced positive stock returns as well as improvements in profitability. This relationship had been previously explored by Brynjolfsson and Hitt (1996) who studied 367 large firms and found that the investment in IS had made a statistically significant contribution to firm performance.

Other researchers, however, produced different results. The advances in technology had occasionally coincided with lower productivity and profitability in many companies in different sectors (e.g. Irani & Love, 2001). Implementation failures were also reported by more recent publications (Nelson 2007) describing negative consequences for the organizations in terms of financial losses.

IS success is one of the oldest research traditions in IS research. DeLone and McLean (1992;2003) concluded that this huge research could be gathered in six distinct categories/dimensions of information systems: (1) system quality, (2) information quality, (3) IS use, (4) user satisfaction, (5) individual impact, and (6) organisational impact (fig1). The authors did not provide empirical validation of the model; they concluded their study mentioning the need for empirical testing and validation of their taxonomy (DeLone & McLean, 1992). The model has been tested and validated in part or in full (meaning one or more of the categories identified) and has been validated as a measuring framework of IS success (Kulkarni et al. 2007; Petter et al.2013).

The evaluation of Information Systems (IS) success or effectiveness (both terms are used interchangeably) has attracted the academic interest/research but researchers are still trying to identify the constructs which can measure IS success in a comprehensive manner (Rai, Lang & Welker, 2002). For the purposes of this research, the remaining of the paper will focus on 2 of the identified categories: Information Quality and Organisational Impact which has been operationalised to measure Organisational Performance when using financial and non-financial measures. Both constructs are discussed in the subsequent paragraphs.

![DeLone and McLean Model (1992; 2003)](image)

**Organisational Performance**

Organisational Performance is a continuous open research question with many studies using it as their ‘ultimate dependent variable’ (Cameron & Wheeten, 1983, p.200) as a multidimensional construct (Venkatraman & Ramanujam, 1986) with diverse measures and different definitions (see Kirby, 2005). Scholars have utilised a variety of indicators and variables to define and measure Organisational Performance reflecting their research backgrounds. Neely, Gregory and Platts (1995, p.80) defined it as the “Process of
quantifying the efficiency and effectiveness of action”. In this regard, the most popular definition is given by Yamin, Gunasekaran & Mavondo (1999) according to which “Organisational Performance refers to how well an organisation accomplishes its market-oriented goals as well as its financial goals”.

Scholars and practitioners have used different measures to evaluate the performance of organisations. Business and strategic management scholars relied “almost solely on financial measures of effectiveness” (Hitt, 1988, p.29). On the other hand, marketing scholars have utilised both economic and non-economic as well as generic measures to assess effectiveness (e.g. Katsikeas et al., 2000). Modern theories and concepts as well as the implementation of balanced scorecards have identified the need for the use of financial and non-financial measures for the operationalisation of Organisational Performance so that valuable conclusions can be derived for the company and the employees (Amir & Lev, 1996). In a more recent research, Richard et al. (2009) view organisational performance “as a term that encompasses three specific areas of firm outcomes: (a) financial performance (profits, return on assets, etc.); (b) product market performance (sales, market share, etc.); and (c) shareholder return (total shareholder return, etc.)”.

The construct of Information Quality
Information quality is conceptualised as the quality of outputs produced by the information system (DeLone and McLean, 1992; 2003), which means the reports but it can refer to how users value the overall information that is available to them. Information quality has been used widely either as a construct or as a dimension of user satisfaction measuring instruments (Baroudi & Orlikowski, 1988; Doll et al., 1994). Exploring through a different perception, Larcker and Lessig (1980) formulated six questionnaire items for measuring the perceived importance and usability of information. Some researchers modified the D&M (2003) construct adding items from other relevant frameworks (Argyropoulou, 2012; Gorla, Somers & Wong, 2010,).

The Literature Gap and Research Propositions
There are limited studies that have explored the influence of information systems and used organisational performance measures for their dependent Variable (Argyropoulou, 2012, Chang & King, 2005; Bernroider, 2008). However, they produced conflicting findings (Sircar, Tumbow & Borodoli, 2000; Peter, DeLone and McLean 2012). The description of the dependent variable (Organisational Performance) as well as the variables measuring it, still attract research attention. Melville et al. (2004, p. 285) note that “IT business value scholars are motivated by a desire to understand how and to what extent the application of IT within firms leads to improved organisational performance”

Treating reports as the main product of any Information System, (Gorla et al., 2010) it is easy to understand that these products should have the basic characteristics of timeliness and reliability that affect performance. Poor data and reporting quality will affect negatively the customers, the decision making process and strategic objectives will be difficult to archive (Law & Ngai, 2007). In addition, the information should have the attributes of usefulness to the users (Calisir & Calisir, 2004) as the IS success is based on the needs of current and future users (Wu & Wang, 2007). Thus, we propose that:

P1: Information quality is positively related to organisational performance when this is measured by financial terms.

P2: Information quality is positively related to organisational performance when this is measured by non-financial terms.
**Operationalisation of constructs**

The study uses the Chang and King (2005) items for Information Effectiveness, along with several new items found in older and more recent research. For the operationalisation of Organisational Performance (dependent construct), the study used 26 items representing the four Balanced Scorecard (BSC) perspectives (Kaplan and Norton, 1992; 2005). Financial measures incorporated traditional measures like income, profit, and costs. Non-financial measures, on the other hand, meant to measure the organisational performance in relation to customers (e.g. customer satisfaction-retention), innovation and forecasting ability, organisational flexibility etc. 7-point Likert scale was adopted.

**Research Design**

Data for this study were collected by means of a web questionnaire and a sample of 700 Greek companies of different sizes operating in various industries. A web link was provided to the IT managers of the targeted companies who were considered to be the most knowledgeable respondents (Forza, 2002). This web survey started on April 2010 with a pre-notification inviting the IT managers to participate in our research and a link to the survey was sent one week later with another cover letter. Two reminders were issued subsequently one week after the first call notifying those that had not responded of a forthcoming deadline for the closing of the questionnaire. 168 usable responses were collected from different industries and company sizes. The Mann–Whitney test was run between late and early respondents to examine the null hypothesis that there is similarity in all the variables across the early and late respondents. The test showed that no significant differences were found among the variables used. As a result, we could argue that non-response bias was not an important issue and the data were unlikely to be biased of non-response errors.

It should be noted that we took all possible measures, suggested by the literature, to avoid Common, Method Variance: “identification of the most informative person, attempt to motivate key informants to co-operate with the study, minimisation of elapsed time, consideration of the impact of alternate framing of questions and finally, the use of pre-tested and structure questions” (Podsakoff et al., 2003; Reio, 2010). In addition, the Harman's single factor test, when using exploratory factor analysis, showed that no single factor accounted for the majority of the variances explained, which means that common method bias was not a major concern in our research (Podsakoff et al., 2003).

**Sample characteristics**

Table 1 shows that the participating companies represent many different industries with nearly 60% of the companies in manufacturing, pharmaceuticals and dairy firms followed by commercial firms /retailers (25%) and services like banking, hospitals and consulting companies (15%). As it is seen in table 1, our sample comprised mainly companies employing more than 50 people which was expected as this had been determined for our targeted group as micro SMEs were unlikely to have implemented IS for our research.

<table>
<thead>
<tr>
<th>Type of industry</th>
<th>Number of responses</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing and construction</td>
<td>99</td>
<td>60%</td>
</tr>
<tr>
<td>Commercial</td>
<td>42</td>
<td>25%</td>
</tr>
<tr>
<td>Services</td>
<td>27</td>
<td>15%</td>
</tr>
</tbody>
</table>

Table 1-Industry classification
Data analysis and findings
Before proceeding to any statistical test, the variables were tested for normality. All skewness values were much less than ±2 and all kurtosis values were much less than ±7. The cut off points are: for skewness < ±2 and kurtosis < ±7 (Curran et al. 1996). 57 variables were used in this study: 26 variables aimed at measuring Organisational Performance and 31 measured Information System Quality. Exploratory Factor Analysis (EFA) was followed as there was limited empirical basis regarding the number of the a priori factors that could exist (Fabrigar et al. 1999).

We followed the steps and advice recommended by Fabrigar et al (1999) to “arrive at parsimonious model and extraction of the common factors needed to account for the pattern of correlations among the measured variables” (p. 277). Varimax and Promax rotation techniques were employed but the final decision favoured Promax to test the reliability of the scales and obtain the minimum number of factors. The latent root criterion, the scree test and the percentage of variance explained were used in the analysis (Hair et al, 2010). Cut off point for item loading was 0.5 and the initial 57 variables were reduced to 51. Following the Promax rotation, the pattern mix indicated 8 extracted factors: 4 factors could be attributed to the construct of Information System Quality and 4 factors were extracted for the measurement of Organisational Performance. The reliability test results along with the new factor names are depicted in table 2.

Table 2- Factors measuring IS effectiveness and Organisational Performance

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Factor Name</th>
<th>Cronbach a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Quality</td>
<td>Information usefulness timely</td>
<td>0.958</td>
</tr>
<tr>
<td></td>
<td>Information validity reliable</td>
<td>0.942</td>
</tr>
<tr>
<td></td>
<td>Report effectiveness</td>
<td>0.863</td>
</tr>
<tr>
<td></td>
<td>Report usefulness</td>
<td>0.958</td>
</tr>
<tr>
<td>Organisational performance</td>
<td>Growth and development</td>
<td>0.953</td>
</tr>
<tr>
<td></td>
<td>Dynamism and Vigilance</td>
<td>0.948</td>
</tr>
<tr>
<td></td>
<td>Financial performance</td>
<td>0.957</td>
</tr>
<tr>
<td></td>
<td>Marketing performance</td>
<td>0.943</td>
</tr>
</tbody>
</table>

Organisational performance factors
The growth and development factor contained variables that measure the organisation’s ability and flexibility to grow and achieve strategic goals by sharing information in a timely manner. The dynamism and vigilance factor contained variables that measure the organisation’s ability and flexibility to learn and respond fast to changes (new product/service development, defect free deliveries, range of new products, innovation capability etc). The marketing performance factor referred to a firm’s ability to meet customer needs e.g. customer retention, customer satisfaction, on time delivery, customer complaints etc. The financial performance factor referred to typical financial measures such as income, various costs and gross profit.

Information quality factors
Information Usefulness factor contained variables such as accuracy, importance and relevance that measure the practicality/utility of the information provided by the system. Information Validity referred to the information’s validity and reliability for the decision making process. Report Quality measured how the reviewed data could help the decision
making process whereas Report Effectiveness indicated how easily reports could be changed and updated.

All factors satisfied the statistical and conceptual criteria for acceptance, and were included in the proposition tests. In this research, reliability analysis was performed in order to assess the internal consistency of the factors. Reliability was assessed by using Cronbach’s Alpha coefficient (Cronbach, 1951), which is the most common way to estimate the reliability of such scales (Nunnally, 1994). Nunnaly’s (1994) threshold level of acceptable reliability being an alpha coefficient of 0.70 or greater was adopted. All scales were found to satisfy this criterion with Cronbach’s a coefficient comfortably higher than the cutoff point of 0.70 (Hair et al, 2010).

In light of the extracted dependent factors, 4 hypotheses were formed (see table 3). For the purposes of this research, the Information Quality factors were considered as the independent variables (IVs) and the factors that measured Organisational Performance became the dependent variables (DVs). In order to test and quantify the relationship between the IV and the DVs, multiple regression analysis was performed. Table 3 summarises the model evaluation and ANOVA results.

Table 3- Results from the regression analysis

<table>
<thead>
<tr>
<th>H1</th>
<th>Financial Performance increases if Information Quality increases</th>
<th>Rsquare</th>
<th>F</th>
<th>Sig</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2</td>
<td>Marketing Performance increases if Information Quality increases</td>
<td>0.594</td>
<td>46.017</td>
<td>0.000</td>
<td>accepted</td>
</tr>
<tr>
<td>H3</td>
<td>Growth and Development increase if Information Quality increases</td>
<td>0.523</td>
<td>32.939</td>
<td>0.000</td>
<td>accepted</td>
</tr>
<tr>
<td>H4</td>
<td>Dynamism and Vigilance increase if Information Quality increases</td>
<td>0.500</td>
<td>29.758</td>
<td>0.000</td>
<td>accepted</td>
</tr>
</tbody>
</table>

Discussion - Contribution

The results from the statistical tests (H1-H4) showed a statistically significant positive relationship between Information Quality and Organisational Performance factors. Specifically:

*Information quality is positively related to growth and development*

The impact of information quality on organisational performance has been evaluated by previous studies. Relevant papers focused either on the use of the information (e.g. Kositanurit et al., 2006; Shih 2004; Wu & Wang, 2006) or on the quality of the reports produced by any Information System (Gorla et al., 2010). This research, however, demonstrated how four validated factors, attributed to Information Quality, can help a company grow with improved flexibility and information sharing.

*Information quality is positively related to dynamism and vigilance*

A statistically significant relationship was found which coincides with previous findings in a sense, that the information/reports produced by any IS will enhance innovation, forecasting as well as R&D if they are perceived to enhance problem solving and decision making (Chang and King, 2005; Kahn et al., 2002).
Information quality is positively related to marketing performance

The model indicated a statistically significant relationship between Information Quality and Marketing Performance which contradicts the limited previous findings of no statistical relationship between Information Quality and competitiveness (Teo & Wong, 1998). According to our results accuracy, timeliness and clarity of information can contribute to better customer service, retention, less complaints and increased satisfaction.

Information quality is positively related to financial performance

The acceptance of H1 can be considered a key finding form this papers as previous research has shown contradicting and insufficient results (Peter et al., 2008).

Contribution of the Exploratory Factor Analysis to the field of Organisational Performance

Based on the net benefits concept (DeLone and McLean, 1992; 2003) as well as on the Balanced Scorecard approach, this study measured Organisational Performance using financial and non-financial measures. The financial measures that were used, captured the way the key informants see the impact of IS on the financial performance of a firm. Having identified many different variables in the pertinent literature, the use of EFA was deemed the “most appropriate form of analysis given the goal of this specific research” (Fabrigar, et al., 1999, p.273).

One purpose of this research was the development of an instrument that could measure organisational performance in a holistic manner, and “EFA served this purpose by refining the instrument’s scales” (Conway and Huffcutt, 2003). Four distinct factors were extracted from the Exploratory Factor Analysis that can be related to the four BSC perspectives. These factors can now be used in several models for confirmatory factor analysis. Future IS researchers can use our Organisational Performance factors to measure the impact of different IS keeping pace with the IT advances.

For many years researchers have been troubled with the evaluation of Information Systems concluding with a lack of understanding as to why, how, and when to evaluate IS systems (Gorla et al 2010). Our findings can trigger new directions to an old but enduring question. After many months of desk and empirical research, we can now say that this paper has shed some light into the IS field by focusing on how Information Quality may affect Organisational Performance.

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