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Evaluating the Impact of Business Intelligence Tools on Organizational Performance in Food and Groceries Retail

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Abstract
While retailers are spending a significant portion of its information technology (IT) budgets on BI and related technology in order to handle the ever increasing volumes of data, the actual benefits derived from these tools needs to be explored. The study focuses on the organized food and groceries retail, and explores benefits of business intelligence (BI) and hypothesis's a structural causal relationship among its intrinsic attributes, and impact on organizational performance. A focus group of selected senior marketing employees was used to develop and validate the research model. Based on findings from the literature survey and focus group, a survey instrument was developed to empirically validate the research model. Data collected from senior marketing executives and managers from six organized food and groceries retail was analyzed using exploratory factor

analysis, confirmatory factor analysis, and structural equation modeling. Five major categories of BI were identified: (1) access to data quality, (2) improved managerial effectiveness, (3) improved operational effectiveness, (4) improved customer orientation and (5) improved organizational efficiency. From the structural causal relationship analysis, a significant relationship was found between intrinsic attributes and benefits of BI and data quality. The structural equation model also suggests a significant relationship between BI and data quality on organizational performance.
Keywords: Business Intelligence (BI), Analytics, Data Warehouse, Organized Food and Groceries Retail, Organizational Performance.

Introduction

Today's retailers function in a highly dynamic and complex environment, demands agile solutions and for this reason are investing in information technology (IT), as a way to improve organizational performance and the quality of operations. As per the recent BCG analysis, the Indian retail Industry is expected to double to $1 trillion by 2020 from $600 billion as of 2015 and the retail market is expected to grow at an aggressive rate of 12% (Mohapatra, 2015). According to the report, this rapid growth is fuelled by income growth, urbanization, nuclearization and attitudinal shifts of customers. Indian customers are experiencing a change in trends from unorganized to organized retailing and changing business practices with FDI participation in Indian retailing. Currently, India's organized retail sector is addressing to the unique and diversified needs of customers by adopting modern technologies to support customers in shopping, and in the way they pay bills. Large retailers (e.g. Wal-Mart) use sophisticated inventory management technologies, including electronic data interchange with suppliers, to increase operational efficiency and improve services.

The appropriate success measure depended upon the perspective of those evaluating success or the nature of the problem being addressed (Melville et.al, 2004). The measurement of information systems (IS) success or effectiveness is critical to the understanding of the value and

efficacy of IS management actions and IS investments (Delone and Mclean, 2003). Retail business intelligence systems were once the domain of a few power users in merchandising groups who were willing to suffer through primitive user interfaces in order to gain a competitive edge in decision-making (Ross, 2005). Earlier, the impact studies of information systems on business operations in food retailing was discussed mainly for simple financial reporting, sales analysis, cost reduction purposes and to enhance customer service, but little research has been done on evaluated performance and efficiency impacts. Past studies have shown that it is difficult to pin down the link between IT and organizational performance (Palmer and Markus, 2000). While there is a belief that IT has strong effect on business success, empirical studies remain mixed (Barua and Lee, 1997).

Information Technology Tools in Retail

Retailers' performance is affected by all the participants at the retail at all the levels, including their suppliers and distributors. Retailers are realizing the benefits of modern technologies like point of sale (POS), bar coding and scanning, electronic data interchange (EDI), radio frequency identification (RFID), data warehousing (DW) and data mining (DM) used in retail operations for various purposes and has become vital to stay ahead in global competition. RFID has the potential to offer tighter management and control of the retail supply chain (SC), reductions in shrinkage, labor cost and improvement in customer service (Jones, et al., 2005). Data Mining is a power tool for retail SC management in reducing risk level of business, controlling inventory, predicting customer's behavior and improving customer relationship management (CRM) (Kusiak, 2006).

Retail organizations get direct benefit adopting POS by facilitating shorter checkout times and better customer service in store (Cassidy, 1994). Retailers' emphasis on providing higher inventory related customer levels with fewer inventories (Weber and Kantamneni, 2002). POS has the ability to offer improvements in retail store management and customer service by tracking the costs directly to specific products (Cassidy, 1994) and focusing timeliness and accuracy of information, which in turn will contribute to generate the purchase orders for the needed items on time, accurately and within the budget. Leveraging BI to enhance business operations has become a top priority

in business strategies to differentiate themselves (Joseph O. Chan, 2006).

Business Intelligence or BI is an umbrella term, introduced by Howard Drenser of the Gartner Group, in 1989, that describes set of concepts and systems to improve business decision making by using fact-based, computerized support systems (Nylund, 1999). Ghoshal and Kim (1986) referred BI as a management philosophy and tool that helps organizations to manage and refine business information for the purpose of making effective decisions. BI is not constrained to individual departments in organizations, but rather is viewed as essential at corporate level (Mcknight, 2004). Quick Response (QR) code on the product allows the customer to scan with their smart phone if they would like to know more about the product. Kulp, Lee and Ofek (2004) suggest that manufacturers are better able to plan production and deploy resources in a cost-effective manner than retailers. Their findings suggest a more balanced view that food retailers also benefit from an expanded use of decision sharing technologies. Presently retailers are relying on predictive analytics to make important decisions across every phase of their operations where they are largely driven by the availability of data at a large scale.

Effectiveness of BI in Retail Operations

Most of the IT investment in the past decade were made in order to manage day-to-day operations (Williams, 2004; Williams and Williams, 2007). But findings from scientific and professional researchers suggest that these organizations are still data-rich, but information-poor (Forslund, 2007; Gibson et al., 2004; Williams, 2004; Williams and Williams, 2007). This means that these organizations lack the kind of actionable information and analytical tools needed to improve profits and performance.

Innovative information systems are greatly contributing to improved operational efficiency for retailers, but BI plays a greater role in effectively managing the business to future success.

In today's competitive retail market, BI tools play a central role on organizational efficiency and the success lies in how well retailers manage their BI tools. Although much is known about the general effect of information technology on productivity, there is less understanding of the value of specific IT applications and the factors that contribute to organizational performance.

According to Khesraw Mansoory (2010), technology has been significant in retail industries as a way to achieve goals. The reason why technology is important is mainly because it can help the retail industry to improve in certain areas such as supply chain management, customer experience, inventory management and loss prevention. A heavy dependence on technology is being assimilated into all aspects of life, including how we choose to shop (Carlyle, 2012).

Information System refer to interaction between people, procedures and technology in the process of capturing, transmitting, storing, retrieving, manipulating and displaying data and information for a specific purpose.

Business Intelligence (BI) combines data gathering, data storage and knowledge management with analytical tools, to present complex and competitive information to planners and decision makers (Negash and Gray, 2008). The Data Warehouse Institute (TDWI) describes BI as a "special purpose" information system, the purpose being decision support: "BI programs usually combine an enterprise data warehouse and a BI platform or tool set to transform data into usable, actionable business information" (TDWI, 2008).

Organizational Performance is a multifaceted construct that defines measurement by a single number (Quinn and Cameron, 1983; Zammuto, 1984). Performance is a set of financial and nonfinancial indicators that gives information regarding the achievement of objectives and results (Lebans and Euske, 2006).

Literature Review

Earlier studies on financial services firms indicate that use of BI is identified by revenue-generating and revenue-retaining opportunities with customers, and the organization is able to provide a quick response with increase in revenues and decrease in costs. The end of 1990s witnessed innovators considering how to leverage IT for strategic management purposes, to manage customer profitability, improve operations performance, front-office business processes and to improve indirect business processes-such as budgeting and business planning (Williams and Williams, 2003).

Bernhard et.al (2012), building upon DeLone and McLean's information systems success model, develop a BI quality and performance model and identified the ultimate performance predictors as user satisfaction and the impact of BI tools on managerial decision

quality, both of which are determined by data quality. BI tools improve decision-making among other benefits, stock optimization, quality decision making, improved ability to anticipate earlier changes on the market by the retail managers (Olexova, 2014).

Singh (2012) data mining tools are capable of discovering patterns in data in few hours while an expert human quantitative analyst may find number of years to help make decision in complex supply chain management, customer relationship management to collect and analyze transaction records continuously. Shrivastava (2011) in times of global recession BI tools like data warehousing, data mining and OLAP provide quality actionable information to the retailers that helps them in increasing their revenues.

Şerbănescu (2011) implementation of BI solution helps the users with relevant information in due time by simplifying the search for complex decision making, allowing rapid reaction to changes with a competitive advantage. Jie Lin and Xu Xu (2009) data mining technology is used to find interesting patterns, which can be organized for global customer retention. Cheryl et.al (2008) in their hypothesized model found that IT capability 1) has an indirect tie to business performance through customer orientation and 2) interacts with intra-organizational trust in predicting customer orientation.

When stores adopt decision sharing technologies such as scan-based trading, computer assisted ordering and vendor managed inventory practices are showing improved performance. Zhen Zhu and Nakata (2007), in the study based on the literature that suggests that business performance is multidimensional (consisting of market and financial dimensions), and that customer orientation is facilitated by information systems (consisting of information technology, or IT, capability and information services), IT capability positively moderates the impact of customer orientation.

Lönnqvist and Pirttimäki (2006), based on literature review, identify and assess measurement approaches for two different purposes: determining the value of BI and managing the BI process within an organization. Based on few observations on the concept of value and justifying the value of BI, value is assessed from the viewpoint of a company using BI in the form of improved profit or of the user of the intelligence perceived usefulness.

According to Guy and Linda (2005), customer profitability can be increased and customer attrition decreased when BI technology

enables business management to identify when up-sell and cross-sell opportunities exist and interventions are needed. Frates and Sharp (2005) continually discovering new customers requires both attitudinal and behavioral changes in a company's BI function and in the way it obtains information from and about its customers. Expanding the use of BI and applying it more creatively enables companies to leverage a key asset, their customer base, to identify, explore and expand new markets at minimal cost. Gibson, Arnott and Jagielska (2004) states that in an uncertain and highly competitive business environment, the BI system provides significant business value by improving the effectiveness of managerial decision-making and suggest that there are significant intangible benefits provided by BI.

In a longitudinal study by Devaraj and Kohli (2003), comprising eight hospitals for a three-year period on various financial and nonfinancial measures of hospital performance and technology, provides evidence that technology usage was positively and significantly associated with measures of hospital revenue and quality, and this effect occurred after time lags. Thomas and Anne (1997), investigates linkages between information technology (IT) and firm performance and develops an integrative, resource-based theoretical framework in the retail industry and found that ITs alone have not produced sustainable performance advantages in the retail industry. The study establishes that some firms have gained advantages by using ITs to leverage intangible, complementary human and business resources such as flexible culture, strategic planning-IT integration and supplier relationships.

James et al. (1996) in the study indicate that information technology is a productive input for retailers. As 1990s came to a close, innovators were beginning to look at how to leverage Information Technology for the purposes such as strategic enterprise management, managing customer profitability, improving supply chain and/or operations performance, improving front-office business processes-such as sales force management and campaign management, improving indirect business processes, such as budgeting and business planning (Williams and Williams, 2003).

The purpose of this research is to evaluate the benefits of BI tools in functional areas in organized food and groceries. The study proposes to evaluate the impact of BI tools on organizational performance of organized food and groceries retail.

Theory Development

Research model and Hypothesis

Earlier empirical research on data warehousing (DW) or BI (Lee et al., 2004), on organizational performance in retailing firms, shows that data warehousing firms achieve better nonfinancial performance, than financial performance. Other studies explored user satisfaction with DW (Chen et al., 2000), factors affecting DW success (Wixom and Watson, 2001) and factors influencing the adoption of DW (Hwang et al., 2004). Given the complexity of the factors influencing organizational performance, no one factor can determine a firm's performance (Lee et al., 2004). According to Capon et al. (1990), no simple prescription involving just one factor is likely to be effective; the determinants of financial performance involve many different factors.

Some of the benefits of BI tools in organized food and groceries retail which have been discussed in the literature survey and considered for the study include: (1) access to data quality; (2) improved managerial effectiveness; (3) improved operational effectiveness; (4) improved customer orientation and (5) increased organizational performance. Currently, retailers are more concerned towards analysis for better customer services to retain the profitable customers and attract new customers.

BI and Data quality

The quality of the information is critical for strategic and tactical decision making that often tend to determine the performance of the firm. Therefore the ability to access quality information that is timely, accurate, complete and thorough about the entire enterprise from various organizational subsystems is often a key to a successful response in a competitive environment (Bradley et.al, 2006).

The main reasons for implementing BI tools in retail operations includes effective handling of information that is data storage, retrieval of information and transforming the information in order to manage the information in an effective way. IT capability, the technological component of information systems, is the ability of a collection of computers and related technologies in an organization to store, process, and communicate information (Bakos and Treacy, 1985). Storage, processing and communicating information are considered the key functions of an IT capability (Molloy and Schwenk, 1995).

According to Bakos and Treacy (1985), IT capability consisted of nine items to evaluate the three primary functions of an IT capability (storage, processing and communicating information) on three performance dimensions (speed, capacity and quality). The impact of IT is experienced at a number of different organizational levels and there are three levels for studying IT's impact: internal strategy (effect on the efficiency and effectiveness of organizational structures and processes so as to achieve goals and objectives); competitive strategy (effect on the ability to out maneuver competitors in the industry in which the organization do business); and business portfolio strategy (effect on which industries to compete in and how to position the organization in these industries).

Based on the above discussion, BI and Data quality can be described by: (1) Data storage (adequacy of data volume) (2) Data Relevance (3) Data Transparency (4) Reliability of data (5) BI supports processing of data in an effective way (retrieving and transforming in order to manage the information) that leads to organizational performance (6) BI provide better support for decision making, resulting in faster, better informed and more accurate decisions.

Respondents were asked to rate in terms of achieving the above-mentioned information-related objectives on a five point Likert type scale (1 = 'not achieved' at all; 5 = 'fully achieved').

From the above argument, we therefore predict as follows:

Hypothesis 1: Retailers implementing BI will have access to better data quality and better-quality decision making.

Managerial Effectiveness

Davenport (1994) made several observations that help to explain why human resources have such powerful performance impacts on IT systems. Machines need people to make them productive because any sustained competitive advantage derived from a strategic information system - such as Wal-Mart's cost advantage based on its difficult-to-imitate IT architecture - rests on the tacit knowledge and abilities of the information services group (Mata, Fuerst and Barney, 1995).

However, the essential element of BI is the understanding of what is happening within an organization and its business environment, as well as appropriate action-taking for achieving organizational goals. From this, one can derive the importance of the human factor within BI. There is no such thing as business intelligence without the people to

interpret the meaning and significance of information and to act on their knowledge gained (English, 2005). This is also consistent with the findings from Finnish research (Hannula, Pirttimäki, 2003) where around 75% of interviewees felt content and humane approaches are the key aspects of BI. They define BI as "the ability of an enterprise to act effectively through the exploitation of its human and information resources." Of course, here, technology is the component that adds to quality information with which business users can analyze business operations: what has happened, what is happening and what will happen in the future.

This includes 3 items that involves back office processes and staffing requirements to empower executives with fact-based decision-making. (1) BI helps in improving quality of work of employees that promotes organizational productivity; (2) BI tools helps retailers in employee retention that takes into account the various measures taken so that an individual stays in an organization for the maximum period of time; (3) BI helps in improving better promptness in services, operating hours, payment options, etc.

Respondents were asked to rate the managerial effectiveness with the BI tools on a five point Likert type scale (1 = "not effective"; 5 = "very effective")

From the above discussion we propose:

Hypothesis 2: Retailers implementing BI will have better ability towards managerial effectiveness.

Operational Effectiveness

Optimization of inventory, based on historical sales and other performance data such as trends in inventory levels, so as to plan accordingly to ensure right product available at right time have always been a retailer's most valuable resources. According to Davenport (1993), a business process is the specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs. In other way, business processes are the activities residing in the black box of microeconomic production theory that transform a set of inputs into outputs. In retail context examples of operations or business processes include store management, vendor management, effective inventory handling to ensure right product available for customer that involve cooperation among all departments

and responsive to each other's needs to accomplish organizational performance.

Analytics can be used to ascertain which products provide the highest level of sales and profits. As observed by Davenport (2009), optimization tools facilitate analysis of the profit contribution of each brand and Stock Keeping Unit (SKU) on the category. A point of sale system provides accurate records of the hourly activity, from which a manager can schedule his staff better to match the demand and accurate sales information, improve the quality of ordering, and hence maintaining the stock position on the shelves. Based on historical sales at the product characteristic level by store, a retailer can optimize the mix of products at the individual store level, minimizing both the likelihood of having too little of a particular item and the likelihood of having too much.

This includes 5 items that improve inventory control measures by tracking out-of-stock items and better procurement of stock. BI tools helps in fraud detection of inventory, misstatement of inventory records etc. (1) better stock optimization; (2) better analysis of shelf space; (3) better analysis of fraud detection; (4) effective billing at POS. Respondents were asked to rate the impact of BI tools on effective handling of retail operations on the four aspects mentioned above on a five point Likert scale (1 = "very negative"; 3 = "neutral"; 5 = "very positive").

In view of the above, we propose the hypothesis:

Hypothesis 3: Retailers implementing BI will have better ability to handle retail operations.

Customer Orientation

To retain loyal customers, retailers employ several customer specific programs and service, such as customer loyalty cards and frequent customer discounts. Implementation of this marketing concept is possible when retailers maintain detailed knowledge of customers that is stored in the data warehouse. The primary reason to maintain knowledge on customers is to increase customer satisfaction, which in turn generates increased sales and profitability (Lee et. al, 2005). Leveraging the enormous available customer data for aligning precious resources with customers' needs has made retailers to deploy advanced tools and techniques for data analysis and generation of reports for effective decision-making.

Over the past decade, retailers have been able to collect enormous amounts of information at the customer level measuring customer purchases, marketing activities and customer attitudes (Verhoef et. al, 2010). Retailers are investing heavily in information systems for accurate tracking and responses to changing buyer needs (Grover and Ramanial, 1999; Varadarajan and Yadav, 2002), explained in CRM practices. These practices suggest that firms expect information systems to support their customer orientation efforts and thereby strengthen business performance; IT capability and information services quality deserve examination as potential moderators. Customer orientation is the organization-wide gathering, sharing and use of intelligence about customers, and coordinated actions based on that intelligence (Deshpande, Farley and Webster, 1993).

Empirical studies are suggestive of the supportive role of information services quality in customer orientation. Jayachandran et al. (2005) show how especially CRM information processes are positively related to customer outcomes, such as customer satisfaction and retention. Ramani and Kumar (2008) show how a customer interaction focus, in which customer value management is an integral part, is also positively related to customer outcomes. Thus, there seems substantial conceptual and empirical evidence that CRM is positively related to firm performance either directly or through improved customer outcomes. Retailers often record transaction data, which can be aggregated to the customer level measuring the number of previous transactions, historical value and types of products purchased (Verhoef et al., 2003). It can also be aggregated to store level, producing metrics, such as total number of visits to a store, total store sales and category sales (Bucklin and Gupta, 2002).

Market Basket Analysis (MBA) is used to understand the probability of a set of products purchased together by a customer (Shailendra and Anil, 2011). Through loyalty programs, MBA and demographic data, retailers are more capable than ever in understanding income levels, buying habits, regional preferences and other factors that can help them design better promotions, product assortments and store layouts.

In view of the above, we propose the following to find the impact of BI on customer orientation to assess whether BI helps to understand customer behavior and their interactions to plan more strategically for customer acquisition and retention.

Present study considers 4 items for customer orientation: (1) identifying customer purchasing patterns; (2) effective customer segmentation; (3) improving customer acquisition and retention; (4) targeting suitable programs for profitable customers.

Respondents were asked to rate the impact of the BI tools on customer orientation along the four aspects mentioned above on a five point Likert scale (1 = "very negative"; 5 = "very positive").

Hypothesis 4: Retailers implementing BI will have better ability towards customer orientation.

Organizational Performance

Business performance in IT is often examined exclusively in financial terms, such as cost ratios. However, business performance should be framed as multi-dimensional (Chan, 2000). Business performance comprised of two dimensions market performance and financial performance (Brady and Cronin, 2001; Morgan and Piercy, 1996). In an empirical study of 168 Belgian firms, DeWoot, Heyvaert and Martou (1978) found that financial performance was not explained by technical innovations themselves, but rather by innovation processes that involved little irrelevant disagreement and an attempt to integrate technology with strategy.

A typical method for assessing the monetary value of any investment is to calculate the return on investment (ROI). The problem in calculating the ROI for BI is that the output of the BI process is intelligence; in other words, some kind of processed information. BI tools enhance retailer's performance in terms of ROI by providing visibility into right measures at right point of time as retailers and work to keep costs down while building profits.

In view of the above, we consider 3 items (1) improved return on investment; (2) reduction of operational costs; (3) improved sales per employee, which in turn affects organizational sales and profitability. Because of the reluctance of retail managers to divulge financial data, the authors employed subjective measures (5 five-point Likert scales) to rate the perceived relative performance with the BI tools.

Hypothesis 5: Retailers implementing BI will have better ability towards organizational performance.

Research Methods

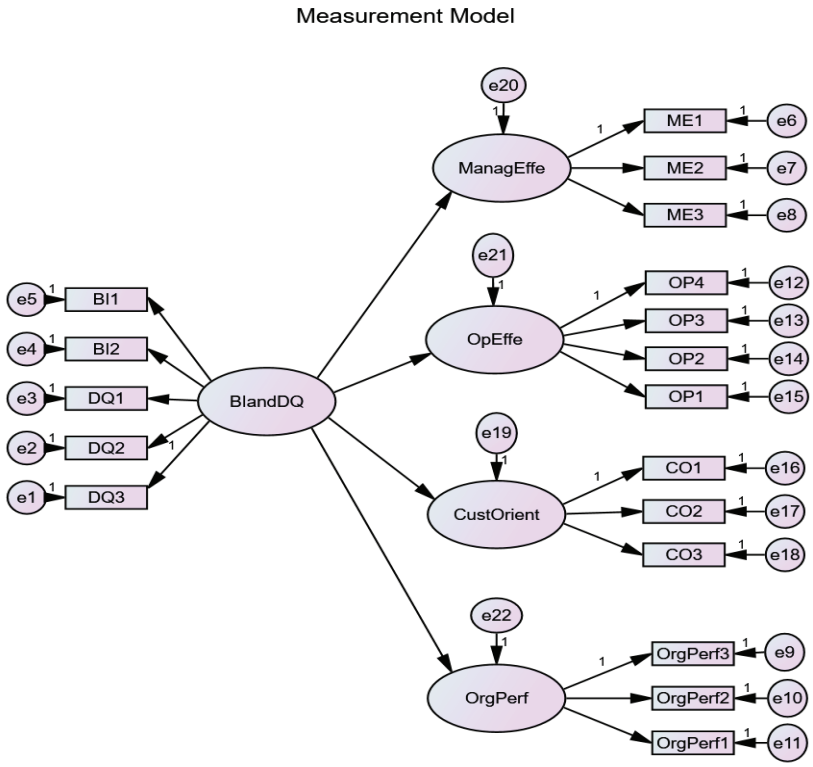
Sample Selection and Data Collection

For this exploratory research, the study population is represented by employees of organized food and grocery retailers in Hyderabad city. Hyderabad city is considered as one of the oldest evolution patterns for supermarkets and is a retail intensive place with IT enabled service hubs. The sampling method is convenient sampling, employees belonging to the six retailers, namely More (Aditya Birla Group); Reliance Fresh (Reliance Group); Spencer's (R.P Goenka Group); Big Bazar (Future Group); D Mart (Avenue Supermarts) Ltd; Metro Cash and Carry (Wholesale Retailers-Indian subsidiary of Metro AG).

Sample

Target respondents were the senior IT managers, data analysts, senior marketing managers, floor managers, as they were best suited to answer questions about both their management domain and firm performance and the sample is constrained to specific organized food and groceries retailers. A total of 150 employees were considered, the respondents representing 6 retailers, convenience sample approach was followed and ensured that key informants were chosen as respondents on the basis of their knowledge of business intelligence tools at the respective retail outlets. The sample size was equally distributed among the six organized retailers from the Hyderabad city because it is among the first cities in India that consist of different organized retail formats - convenient stores, supermarkets, hypermarkets and wholesale retailers with large customer base. The respondents were employees of the respective retailers with experience ranging from two years to above 5 years.

Fig. no. 1. Measurement Model



Data Analysis

An exploratory factor analysis (EFA) using SPSS 21 was conducted to identify major dimensions of impact of BI tools on organizational performance. The reliability of the variables was measured using Cronbach's alpha to establish inter-item reliability; KMO and Bartlett's Test was used to measure sample adequacy. To examine relationships among BI and data quality and other factors, AMOS 21 was used to perform Structural Equation Modeling (SEM) based on a correlation matrix with the maximum likelihood. Overall fit of the model was assessed by various statistical indexes such as tests of absolute fit (Chi-square (χ^2)) and tests of relative fit. Figure no. 1 provides a graphical summary of our hypotheses (path-model).

Findings and Discussion

Exploratory Factor Analysis

The research process includes two steps. The first step involves the preliminary design of questionnaire that included literature survey to identify various parameters that measure the impact of BI tools in organized food and groceries retail. After combining various parameters following the literature survey and learning from personal interviews reviewed by marketing faculty and senior sales people from food and groceries retailers, a total of twenty attributes identified as discussed above are considered for factor analysis. The questionnaire was administered to 20 known senior employees; the collected responses were then discussed with them to explore their opinions. Exploratory factor analysis using SPSS 21 was applied to the responses; considering the factor loadings more than 0.40 were selected; 18 operational variables found to be more than 0.4 were used in this study to learn the effect of BI tools on organizational performance from the employee's perspective. Factor analysis resulted in five factors; one item from BI and data quality (data relevance) and one item from customer orientation (improving customer acquisition and retention) resulted in factor loadings less than .4 and hence were removed.

The second step consists of a cross-sectional research design with a survey administered to 150 employees of six organized food and grocery retailers. The study was conducted during the months of October-November 2016, by personally approaching the employees by inviting them to participate in the survey to complete the questionnaire. Questionnaire based on the 18 items, was prepared on a 5 point Likert scale, was then distributed personally to senior IT managers, data analysts and senior marketing managers belonging to the six retailers of different organized food and groceries retail chains, located in Hyderabad city.

In order to identify the relationship between the variables, a PCA with VARIMAX rotation was performed to obtain the factor structure. The factor analysis resulted in five factors in the rotated component matrix. The KMO and Bartlett's Test value is 0.758, suggesting appropriateness for sample adequacy. Also, the test relates to the significance of the study thereby showing the validity and suitability of the responses collected to the problem being addressed in the study. Performance measures should be valid, reliable, relevant, practical and well suited to the particular measurement situation (Hannula, 1999;

Lönnqvist, 2004). According to Kaydos (1999), anything can be measured to a useful degree, especially in a business environment. The rotated factor analysis suggests 5 factors with a total variance of 75.751%, with overall reliability 0.832. It is observed that the rotated component matrix resulted in significant factor loadings show the correlations between each variable with values greater than .5.

The five factors with the factor loadings along with the variance and reliability coefficient, Cronbach alpha (α) is shown in table no. 1.

Table no. 1.

The KMO and Bartlett's Test value is 0.758; Total variance is 75.757%		
Dimensions	**Variables**	**Factor loadings**
BI and Data Quality: *this factor has variance of 31.691%; Reliability Coefficient 0.844.*		
BI and Data Quality	1.Data storage 2.Data transparency 3.Reliability of data 4. Effective data processing 5. Better support for decision making	.737 .833 .721 .615 .808
Managerial Effectiveness: *this factor has 17.861% of variation; Reliability Coefficient 0.811.*		
Managerial Effectiveness	1. Improved promptness in services, operating hrs, payment options, etc. 2. Better employee retention 3. Improved quality of work of employees that promotes wellness and happiness	.790 .858 .842
Operational Efficiency*: this factor has 11.820% of variance; Reliability Coefficient 0.862*		
Operational Effectiveness	1.Better visibility into supply chain 2.Better stock optimisation 3.Better analysis of current business practices 4.Better analysis of fraud detection	.541 .722 .770 .771
Customer Orientation*: this factor has 7.374% of variance; Reliability Coefficient 0.891*		

Customer Orientation	1.Identifying customer purchasing patterns; 2.Effective customer segmentation; 3.Targeting suitable programs	.713 .939 .867
Organisational Performance: *this factor has variance of 7.011%; Reliability Coefficient 0.762*		
Organizational Performance	1.Improved return on investment 2.Reduction of operational costs 3.Improved sales per employee	.606 .567 .752

From table no. 1 it is observed that the variance of the first factor (BI and data quality) is found to be 31.691%, with a reliability coefficient (α) of .844; the second factor (managerial effectiveness) has a variance of 17.861%, with α equal to .811; the variance of third factor (operational efficiency) is 11.820%, with α equal to .862; the fourth factor (customer orientation) has a variance of 7.374% with α equal to .891; and the variance of the fifth factor is 7.011%, with α as .762. The individual item reliability for all the factors resulted in high values, all construct-specific loadings range from .762 to .891.

Validation of Measurement Model

A Confirmatory Factor Analysis (CFA) was conducted using AMOS 21 to measure acceptable levels of goodness-of–fit for the measurement model and to find specific evidence of construct validity. The constructs were subjected to Convergent validity, Composite Reliability and Discriminator validity to satisfy the validity and reliability constructs.

The measurement model evaluates the latent constructs measured in terms of observed variables and describes the validity and reliability of the measurements. Before testing the structural equation model, multiple indicators of each construct was grouped together in order to equalize measurement weight across indicators (Byrne, 2001).

Table no. 2 a: Calculated as [Σ(std. loading)^2] / [Σ(std. loading)^2 + Σξ*i*]
b: Calculated as [Σstd. loading]^2 / [(Σstd. Loading)^2 + Σξ*i*]

Variables	Mean	Std. Deviation	Cronbach's Alfa (α)	Standardised Regression Weights	AVE[a]	CR[b]
BI and Data Quality			0.844		0.718	0.926
BI1	5.177	1.177		0.751		
BI2	4.633	1.671		0.854		
DQ1	5.333	1.213		0.680		
DQ2	5,667	1.061		0.621		
DQ3	5.267	1.080		0.735		
Managerial Effectiveness			0.811		0.658	0.846
ME1	4.533	1.422		0.797		
ME2	4.533	1.252		0.970		
ME3	4.667	1.408		0.565		
Operational Effectiveness			0.862		0.750	0.920
OP1	5.267	.8277		0.627		
OP2	4.667	1.322		0.682		
OP3	5.233	1.165		0.935		
OP4	5.600	.6746		0.516		
Customer Orientation			0.891		0.732	0.898
CO1	4.200	1.788		0.761		
CO2	4.200	1.540		0.939		
CO3	4.233	1.633		0.895		
Organizational Performance			0.762		0.610	0.818
OrgPerf1	5.333	1.112		0.621		
OrgPerf2	5.433	.8172		0.591		
OrgPerf3	6.066	.7112		0.380		

Table 2 summarizes the results of the measurement model, including the mean, standard deviation, factor loadings (standardized regression weights), construct reliability and average variance extracted (AVE) for each construct. The standardized factor loadings suggest that all the items have significant factor loadings that range from 0.516 to

0.970, except for one variable in organizational performance with a value of 0.380. It is suggested that the reliability and variance extracted for a latent construct must be computed separately for each multiple indicator construct in the model using indicator standardized loadings and measurement errors (Hair et al., 1998). Cronbach's Alphas (α) range from 0.762 to 0.891 indicate strong reliability of the measurement model (Nunnally, 1978).

All average variances extracted (AVE) are higher than 0.50 (Fornell and Larcker, 1981), ranging from 0.610 to 0.750. Hence, convergent validity shows that each measurement item correlates moderately with its assumed theoretical construct. Reliability of the factors was estimated by checking composite reliability. According to Fornell and Larcker (1981), composite reliability (CR) greater than 0.7 is considered to be adequate. The composite reliabilities of construct have higher values than 0.70, indicating adequate internal consistency, that range from 0.818 to 0.926. Discriminant validity is done by comparing the AVE's with the squared correlation for each of the constructs. Discriminant validity is supported when the square root of AVE between each pair of constructs is greater than the squared correlations between constructs (Hair et al., 1998; Maxham and Richard, 2002). Discriminant validity is shown when each measurement item correlates weakly with all other constructs except for the one to which it is theoretically associated. Discriminant validity for the study is shown in table no. 3.

Goodness of Fit

The 18 variables were used to measure five constructs through confirmatory factor analysis (CFA). The goodness of model fit for confirmation factor analysis was high with chi-square value of 234.894, with 133degree of freedom, χ^2/df=1.766,(chi-square =234.984; df=133) the statistic for model fit states that the null hypothesis of a good fit to the data cannot be rejected, suggesting acceptable model fit.

Table no. 3

Discriminant Validity					
Component	BIandDQ	ManagEffe	OpEffec	Custorient	OrgPerf
BIandDQ	.847				
ManagEffe	.035	.812			
OpEffec	.546	.236	.866		
CustOrient	.490	-.035	.285	.856	
OrgPerf	.301	.160	.255	.063	.781

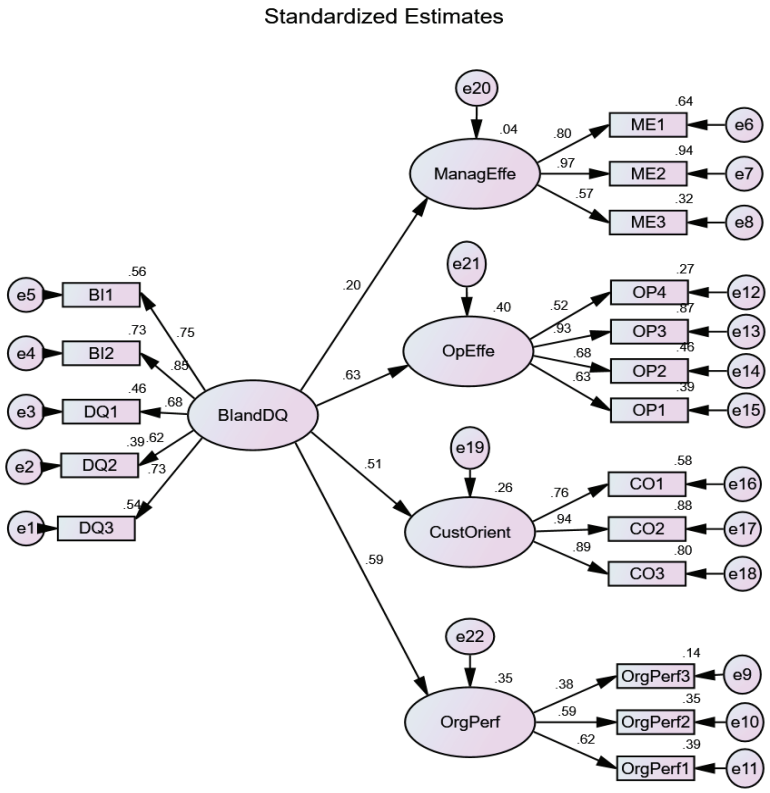
Tests of Relative Fit

Various descriptive fit statistics to assess the overall fit of a model to the data indicate are given as: The Comparative Fit Index (CFI) = 0.925; Incremental Fit Index (IFI) = 0.897 and Normed Fit Index (NFI) = 0.795. The RMSEA value of 0.063 was well within the recommended range between 0.05 and 0.08 (Byrne, 2001 and Browne and Cudeck, 1993).

From figure no. 2 it is observed that the standardized coefficients show a stronger relationship between the factors. The squared multiple correlations (R^2) explain the amount of variance in the endogenous constructs in the model and are indicative of the predictive power of the exogenous latent variables. The explained variance of most of the variables was substantial to moderate (Chin, 1998). The study shows higher values of R^2, indicating that the model is accounting for a large proportion of the variance in the measured items. The R^2 for the constructs is the proportion of its variance that is accounted for by BI and data quality with customer orientation is .265 (26.5%); with operational effectiveness is .399 (39.9%); with organizational performance is .349 (34.9%) while managerial effectiveness has low value of 0.04 (4% of variance). Figure 2 depicts the final structural equation model in terms of standardized factor loadings of indicators for measurement model and significant path coefficients for standardized path coefficients for each relationship.

Having established the reliability, convergent validity and discriminant validity of the constructs, the next step involves testing the structural model for the hypothesized paths.

Fig. nr. 2. Evaluation of the Structural Model



Hypothesis Testing

Structural Equation Modeling (SEM) using AMOS 21 was performed to test hypothesis H1 to H18. The measurement path estimates were set equal to 1 in order to scale the latent variables.

Table no. 4. Standardized Regression Estimates of the Hypotheses Tested

No	Constructs/Hypothesis	Path Coefficient	Critical ratio or t value	Hypothesis Supported/not Supported
H1	**BI Management**			
1	Adequacy of data volume	1*	1*	-

2	Data Transparency	.296	3.879	Supported
3	Reliability of data	.260	4.381	Supported
4	Effective data processing	.287	3.504	Supported
5	Better support for decision making	.410	3.197	Supported
H2	**Managerial Effectiveness**			
6	Improved promptness in services, operating hrs, payment options, etc.	1*	1*	-
7	Better employee retention	.275	3.934	Supported
8	Improved quality of work of employees that promotes wellness and happiness	.225	3.179	Supported
H3	**Operational Effectiveness**			
9	Better visibility into supply chain	1*	1*	-
10	Better stock optimization	.608	2.454	Supported
11	Better analysis of current business practices	1.007	2.571	Supported
12	Better analysis of fraud detection	1.115	2.807	Supported
H4	**Customer Orientation**			
13	Identifying customer purchasing patterns	1*	1*	-
14	Effective customer segmentation	.202	5.260	Supported
15	Targeting suitable programs	.209	5.134	Supported
H5	**Organizational Performance**			
16	Improved return on investment	1*	1*	-
17	Reduction of operational costs	.147	2.282	Supported
18	Improved sales per employee	.151	2.967	Supported

R- Squares

- Managerial Effectiveness (4%)
- Customer Orientation (26.5%)
- Operational Effectiveness (39.9%)
- Organizational Performance (34.9%)

*Standardized factor loading; the first item for each construct was set to 1. Significant at $p<0.05$

At significance level of 0.05, any critical ratio that exceeds 1.96 in magnitude would be called significant (Arbuckle, 2013). From the table, it is observed that all the values are found to be greater than 1.96 and denote significant covariance between the variables at the 0.05 level (t-values >1.96 represent significance level $p < 0.05$).

The path estimated were found to be best for customer segmentation (t = 5.260) and targeting suitable programs (t = 5.134), while other parameter estimated are also significant at $p<0.05$. By examining causal relationships among all constructs, it was found that all the five constructs of the model has significant positive relationship between BI and managerial effectiveness; BI and customer orientation; BI and operational effectiveness; BI and organizational performance, thus supporting hypothesis H1 to H18. The significant relation between the intrinsic attributes of BI and data quality outputs can help the retail managers to identify improved decision making resulting in improved promptness for various functional areas and improved organizational performance.

Discussion and Implications

The purpose of this research was to evaluate the impact of BI on organizational performance by developing a hypothesized model in organized retail. The confirmatory factor analysis showed an overall satisfactory model fit and hence, the theorized model fit well with the observed data and can be concluded that the hypothesized five factor CFA model fits the sample data well, confirming the predicted relationships. The results confirm that BI and data quality strongly influences the operational effectiveness (.63), organizational performance (.59) and customer orientation (.51), while managerial effectiveness has moderate influence (.20). It has been observed that retail employees are considering strengthening their organizations' use of BI. This study found that BI and data quality corresponds significantly with operational effectiveness and organizational performance. Quality information is helping retailers in verifying the status of the firm’s inventory by directly accessing the customer database, which is in turn reducing the order lead times, resulting in reduced inventory costs for the retailers.

Conclusion and Limitations

Earlier studies revealed that advanced technology tools supports retailers in the process of storage of data, retrieving it and transforming the information in order to manage the information in an effective way. By using common database and shared management BI tools helps manage in effective information sharing among different functional areas to create an effective value. The outcome of the study shows that advancements of data and analytics is enabling retailers towards customer orientation to understand customer's buying behavior resulting in providing product availability, as and when customer needs. To better meet the needs of customers, retailers are trying to keep track of customer preferences and behaviors by implementing predictive analytics and data mining solutions.

From the study the positive association between endogenous factors of BI and data quality reveals that advanced technological tools are transforming data into valuable information to make better decisions that give retailers a competitive advantage and improve the performance of the organization.

However, there are several success factors that consistently enhance BI, understudied and represent an important gap in our knowledge and provide an opportunity for future research. Review of the literature reveals that studies examining the association between information technology and organizational performance are divergent in how they conceptualize key constructs and their interrelationships (Melville et.al, 2004).

The study was limited to food and groceries retailers, the findings are technically applicable only to that group. Retailers with similar operations may find that this study's findings apply in their settings. The researchers chose food and retail in particular because it is observed that information systems are being used in retail operations since previous decades involving POS scanning that has greater visibility in retail than in other industries.

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