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Reasonable e-Business expectancy Analytics in an IoE Edge

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Abstract:With the rapid growth of e-Business applications, several new analytics are researched for assessing the strategy that encompasses the current BI decisions, buying policies, consumer behaviour to e-business and vice versa. The consumer-end views can be composed from their registered IoE edge point devices that are exposed for assessing e-BI strategy. The consumer-end views are considered as the potential data sources that need an effective cognitive analytics system to massively turn into the e-business goldmines. The Internet of Everything motivated consumer-end analytics has much brighter prospective in order to modernise the e-business intelligence applications. In this work, we discuss an intellectual consumer-end analytic system that implements an integrated choice based problem-solving mechanism to generate the insights for the predefined e-business parameters and dynamically suggests the solutions for the prospective BI requirements. For the system implementation, we in specta case base analysis that assesses the e-BI parameters copycatted with some real values. The analysis acts appositive elucidation in small scale e-business data depository to generate potential business worth and the small scale data repository may transform into a big data-value for the modernised e-BI applications.
Keywords: IoE and Analytics, consumer-end analytics, BQ (business queries) knowledge base, IoE edge, e-BI

I. INTRODUCTION

In the current and upcoming days, the IoE tasks are gaining popularities across various Intellectual BI applications. The main aim is to get the insights from large scale network-centric data, such as IoE data that can be used to produce intelligence for the applications. In the current Intellectual domain applications, the network-centric data are highly unstructured and ambiguous, and create research challenges in inferencing the potential knowledge. The survey reveals that time to insight is slow, quality of insight is poor, and cost of insight is high for IoE big data applications, on the other hand, those Intellectual domain applications require low cost, high quality, and real time systems and algorithms to massively transform their data into cognitive values of goldmines. Such cognitive values are utilized as knowledge and insights for creating worth of the Intellectual domain applications [**1-4**].

The IoE (Internet of Everything) driven consumer-end analytics has much bright prospective in order to modernise the e-business intelligence applications. The global IoE evolutionary network capable to connect billions of IoE objects for the purpose of autonomous communication. In e-business intelligence applications, the IoE and analytics play major role towards generating the business insights that enable the e-business to construct a global trends and strategy for the e-consumers. The e-consumers are the real back bone of the e-BI operations. So, the consumer-end analytics are the powerful tools to analyse the current e-business trends and strategy and such analytics deeply consider the e-consumer's feedbacks on several BI parameters that are strongly related to e-trading and other correlated operations [**5-6**]. In figure 1, we sketch an IoE A (IoE and Analytics) schema structure along with its high correlated analytic tasks that can be applied to the e-business intelligence applications.

Statistical computing and visualizations are important tasks of IoEA, that include data manipulation and cleaning, importing and exporting data, managing missing values, data frames, functions, lists, matrices, writing functions, and the use of packages. Efficient programming practices and methods of summarizing and visualizing data are emphasized throughout the IoEA environment. Cognitive computing is an important concern of IoEA, where we build a new computational problem class to address the complex problem situations through a self-learning process. The cognitive computing of big data exploits the power of the several diversified technologies, such as mathematics, statistics, data science, computational science, etc., to build intelligence and insights for the intellectual e-BI applications [7-8].

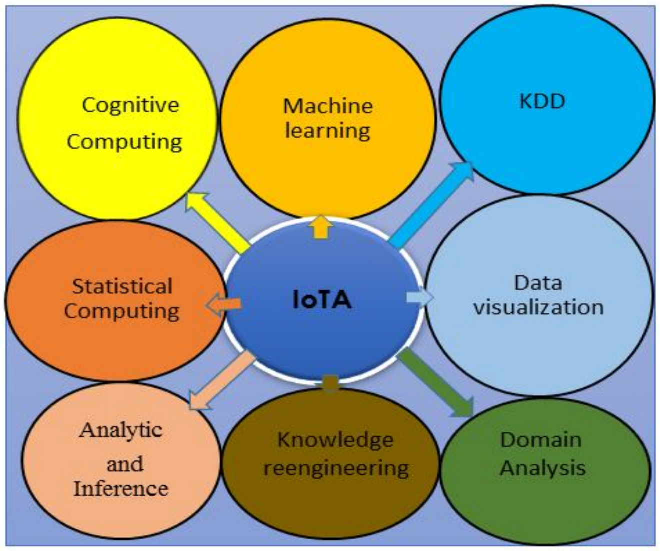

Figure 1. Correlated tasks schema of IoEA for e-BI apps.

KDD (Knowledge discovery on data) accomplishes the way to integrate the data mining with the data analytics that makes the use of IoEA in numerous BI applications. The machine learning becomes extremely important and useful in data science environment to deal not only objective with huge amounts of data and extract knowledge from it but also create trends in IoE big data analytics in increasing extensiveness with all levels of an organization. Domain analysis is an important concern that helps to analyse the important problem scenarios of an application domain associated with physical world. The domain analysis integrates the data domain with intellectual domain applications, such as business, healthcare, and industrial. Knowledge reengineering, analytics, and inferences are the progressive concerns of the data science to re-engineer the superseded knowledge base into a renovated knowledge base system that may ensure higher operational efficiency through making the knowledge base useful and operative.

The knowledge analytic is a major part of IoEA that studies the historical data to research potential trends, analyses the effect of decisions and events, evaluates the performance of complex problem scenarios, and aims to improve values through gaining knowledge and insights. The knowledge analytic is the science of logical analysis that uses mathematics, statistics, computational intelligence, and other analytic tools to discover the potential knowledge and insights from large scale IoEA environment employed for e-BI applications [**9-10**].

The rest of this paper is organized as follows. Section 2 discusses the IoEA schema analytics and applications that motivate to design a system for e-BI applications. Section 3 highlights a detailed configuration of system for e-BI applications. The case analysis and discussion of the proposed system is covered in Section 4. Finally, Section 5 concludes this paper.

II. IOEA SCHEMA: ANALYTICS AND APPLICATIONS

The progressive evolution of IoEA penetrates into each and every intellectual domain application, where the knowledge analytic plays major role. In IoEA applications, the data sources are considered as disparate and agile, and it requires an effective management of several IoE data, such as, customer data, billing information, device data, web services data (e.g. weather and traffic data), sensor data, RFID data, place data, process data, and other data of things. The figure 2 describes application areas for IoEA operations. In this figure 2, we explore numerous data operations and analytics that are implemented on various BI systems that are engaged in different intellectual domain applications.

The IoEA regulates a large scale automated industry through generating real-time tactical and operational decisions and cognitive actuations, and thus, it can be effectively used in many industrial applications to regulate sensitive parameters, such as, machine load and distribution analysis, reliability analysis of machines, industrial safety analysis and monitoring, etc. With the advancement of industries and IoEA, real-time knowledge analytic system has been considered in many contexts to automate an industrial process that involves a high degree of risk [12].

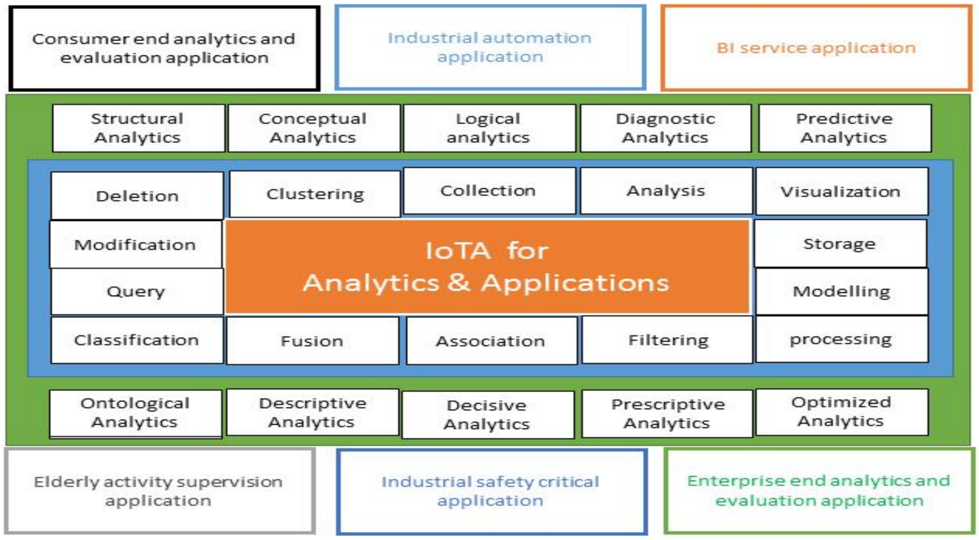

Figure 2. IoEA Schema for Analytics and applications.

Therefore, based on risk quantification, we classify real-time IoEA applications into three different categories: business-critical applications, e.g., IoE applications in business intelligence monitoring, mission-critical application e.g., IoE applications in habitat monitoring, smart city monitoring, smart home monitoring, etc., and safety-critical sensor application e.g., IoE applications in industrial automations, healthcare automations, elderly activity supervisions, etc. Among the three applications, the highest degree of risk is measured in safety-critical IoE application. In business automation environment, IoE data science regulate several smart management tasks, such as, material logistic management, supplier chain management, product lifecycle management, compliance service work flow interoperations and management, proactive prediction of business security strategy, and much more [**11**].

The IoEA also regulates the data of wearable and non-wearable computing devices and generate intelligence through analytic systems to transform into a smart environment in order to monitor several activities, such as human activity supervision, automated coordination of devices according to human activity in a smart home like environment, monitoring traffic congestions, human activities, environmental pollutions, water pollutions, citizen compliance tracking, wastage management, intelligent transportations, and other activities and services in a smart city like environment.

In the above discussion, we explore the application background of IoEA that motivates us to design a system for e-BI applications. In this context, we discuss some relevant studies that are associated with numerous IoEA tasks and operations anticipated with e-BI applications. A system is a real or conceptual structure intended to serve as a support or guide for modelling progressive IoEA functions for intellectual domain applications, and the intended functions are of cognitive, conceptual, theoretical, analytical, and logical varieties.

In our work, we consider an intellectual domain applications, i.e. IoE motivated consumer-end analytics for e-business intelligence domains. For the applications, some innovative problem requirements are identified, analysed the problem requirements in term of proposed architectures, algorithms, functional explorations, structural analysis, mathematical analysis, implementation analysis, computational analysis, and modelled into an operationally feasible system.

III. SYSTEM CONFIGURATION

In this section, we highlight a detailed configuration of system for e-BI applications. In the system, we consider numbers of IoE e-consumer clusters that may be geo-demographic distribution centric over the e-business environment and each cluster corresponds to set of IoE objects that are possessed by the e-consumers as described in figure 3.

The geo-demographic clusters potentially preserve the integrated geographic and demographic IoE e-consumer's data into corresponding data set. That data set creates the big-data problem that analytic system tries to solve it. The IOEA mechanisms, such as data investigations, data wrangling, cleaning, sampling, etc. can be used to get good data; however it is important to know how to use those data to deal with real business problems to extract quick solutions. So in order to deal with the problem, an extensive analysis is performed on IoE e-consumer's data set that minimally includesan ETL (Extraction-transformation-load) operation to fetch the information details to the analytic engine. The analytic engine formulates mainly four types of problem queries, i.e. what happens, why did it happens, what will happen, and how can we make it happen? To solve those four different problem queries, four different analytic operations need to be performed by the analytic engine. As this analytic engine only deals with the e-BI problems, so we term it as e-BI analytic engine.

A. The functional assumptions of e-BI analytic engine are describes as follows.

1) Assume that ETL operational engine is always active to deliver the current information details and the e-BI engine gets desired information details through sending instant query to ETL operational engine.
2) Business queries Inception and problem solutions by the e-BI analytic engine meets the business critical application requirements.
3) e-BI analytic engine supports at least four different analytic operations, i.e. descriptive analytics, diagnostic analytics, predictive analytics, and prescriptive analytics.
4) The knowledge base consists of potential business problems, cases, and solutions to face the genuine business queries.

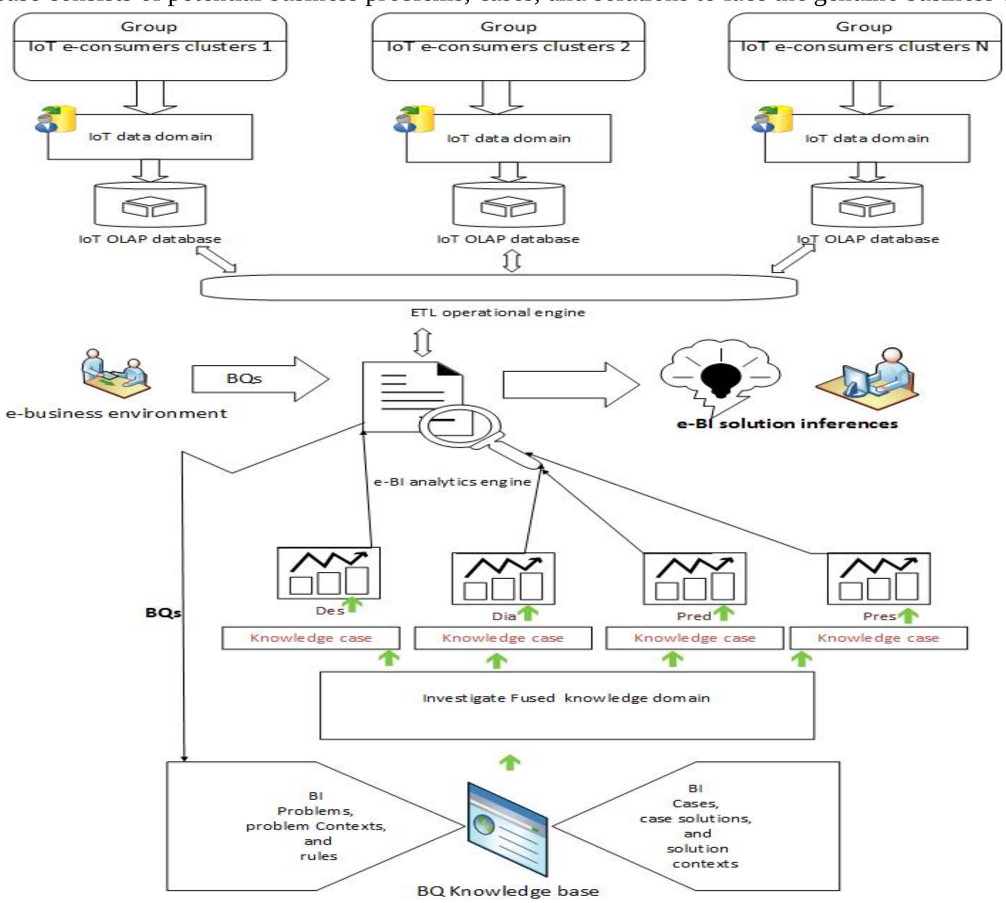

Figure 3. frame for Analytics and applications.

Now, the operational analysis of e-BI analytic engine are described in Algorithm-1.

B. Algorithm-1

1) Input- information details, business queries, knowledge base.
2) Output- prospective e-BI solution inferences.
3) // des← descriptive analytics; dia← diagnostic analytics;
4) //pred←predictive analytics; pres← prescriptive analytics;
5) AS = {des, dia, pred, pres}// four analytic operations
6) KCs= {knowledge cases}
7) Receive the business query (BQ)

8) If BQ ϵ AS_i {for i=1,2,3,4}
9) Then send BQ to Knowledge Base
10) Investigate the fused knowledge domain
11) Invoke the analytic operation(AS_i)
12) diagnose the knowledge cases
13) extract the knowledge case that meets the business query
14) end if
15) while(availability of knowledge case = 'true')
16) activate the ETL operational engine
17) extract the current information details
18) diagnose KCs with current information
19) end while
20) output the desired inferences
21) go to step 5

The BQ knowledge base is an expert system that dynamically models the data frames as per the business queries in order to invoke in specific analytic operations. The e-BI analytical engine has an important role in integrating and synchronising the BQs that are generated from e-business environment, the information details that are extracted from ETL operational engine, and the dynamic Meta data and data frames that are generated from the BQ knowledge base through invoking the analytic operations. The board vision behind this integration and synchronisation are to mine the e-BI solution inferences for the BQs by which small scale e-business data depository generates potential business worth and transforms into a big data-value for the modernised e-BI applications.

IV. ANALYSIS AND DISCUSSIONS

In this section, we briefly analyse an important e-business query, which processing needs the operational mechanisms of our proposed system to perform its knowledge analytic and inference operation. Enabling the IoE based product quality assessment in an advanced BI environment creates several research challenges [**6**]. Here we take a small case example only to visualise the analytic functions of system.

Evaluating the consumer's end quality strategy of a product at any instance of time is a top business query for the e-business environment, in which the potential solution inferences can be studied though assessing an important e-BI parameter, i.e. product rating matrix assessment.

For a cluster of e-business products, let P_k ← product id of the k^{th} product, QS← quality strategy, TQS← target quality threshold, Φ← quality threshold function, N← number of products that are rated, NU_i← number of users having i star rating, and W_i← fixed weights for value i={1,2,3,4,5}.

$$QS\ (P_k) = \sum_{i=1}^{5} NU_i W_i$$

Now if Φ (QS (P_k)) ≥ TQS then quality assessment(Y) = Φ (QS (P_k)) and product P_k has desired quality strategy;
Else if Φ (QS (P_k))<TQS then quality assessment (Y) = Φ (QS (P_k)) and product P_k has poor quality strategy.

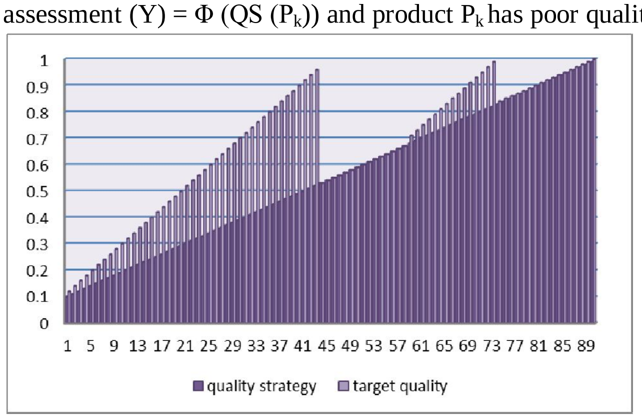

Figure 4. Quality strategy Vs. Target quality analysis.

In figure-4, an analysis is done by considering the case scenarios. In some instances, the quality strategy is mapped to the target strategy of the e-BI applications, but, in some instances many deviations are there in between them. Those deviations can be effectively minimised through the potential e-BI solution inferences.

Now for N number of rated products i.e. k=N, we obtain a list of Y values for the products and such values are normalised and transformed into a knowledge analysis and visualization tool for obtaining the e-BI solution inferences and accordingly the prospective e-BI strategy can be altered.

Hence based on BQ, the BQ knowledge base suggests the suitable knowledge analytic operation to the e-BI analytic engine that operates on the current information of registered IoE devices used by the e-consumers that are exposed to the global IoE network.

V. CONCLUSIONS

In this work, we discuss an IoEA environment, in which knowledge analytic and inference mechanism is implemented. To empower the knowledge analytic and inference from IoEenabled e-consumers, we propose a system that includes an e-BI analytic engine and a BQ knowledge base to execute the analytic operations. future issue, we will extend the individual analytic operation and explore the operational functions of knowledge analytic and inference set-ups for an e-BIenabled IoEA environment.

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