URS (Universal Rating System)

Revision 0.7

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ABSTRACT. With massive evolution in global trade and digital technology i.e. globalization, ubiquitous internet connectivity, digitalization, telecommunication & mobility advancements, IT technology innovations, etc., we as consumers are exposed to unlimited global resources, products, and services to consume. The world today has become flat with minimum barriers and obstacles. Manufacturers/producers/originators are now able to reach to their end consumers with the speed they never imagined. Revolution in telecommunication and smartphone devices has made every piece of information just a click away. All devices are getting smart and real-time interaction possible with individual consumers and capture their feedback. Tones of new data/ information getting exchanged every second on the Internet, on the information highway. This has in turn amplified two important aspects of the product – consumer relationship a. Provided Infinite Product & Services Choices for consumers b. The power is in the hands of consumers to influence the quality of products or services. On the contrary, the availability of these infinite choices and information explosion around us has made our decision making more complex & difficult. We always end up with a dilemma which one to choose when exposed to multiple similar product choices. The problem is with a fundamental difference in information processing performed by the Biological Intelligence we humans have. World of marketplaces has devised a mechanism of ratings and reviews to simplify this decision making. This is the reason we have started increasingly relying on the ratings that are getting published on various marketplaces during our buying decision. But that too raises a lot of questions on authenticity and reliability of those ratings. And therefore, there is a real need today to come up with a universal solution to help deal with this universal problem. URS is such an attempt to change the fundamental backbone of product/services offerings in the market.

Rating in general
Definition: a classification or ranking of someone or something based on a comparative assessment of their quality, standard, or performance. A rating is the evaluation or assessment of something, in terms of quality (as with a critic rating a novel), quantity (as with an athlete being rated by his or her statistics), or some combination of both.

Quality in general
Definition: The standard of something as measured against other things of a similar kind; the degree of something; a distinctive attribute or characteristic possessed by someone or something

1. Introduction

There has been an exponential growth in IT Innovations in the last decade particularly in AI / Machine / Deep Learning which are believed as a market game-changer that can help Humans in effective decision making. Technology like Blockchain & IoT is addressing the fundamental problem areas that were hindering the effectiveness of interactions and transactions e.g. security, processing, data availability & storage of digital data. Blockchain has also made automatic peer to peer value transfer possible.

URS is the project to solve the problem with our own decision making and the dilemma we face against infinite choices. URS can act as a trustworthy tool to effectively ascertain user interaction, storage, and assessment for any kind of asset, product, service, or information. This platform also addresses the automatic p2p value transfer possible to create an autonomous decentralized network between its stakeholders.

This problem related to the quality rating is already addressed in silos by organizations and marketplaces by adopting various rating methods and techniques and making it available for users online. But it is plagued with a lot of fundamental problems and at the end not serving the real purpose. The end objective should be to maintain the transparency and trust factor attached in the end to end assessment cycle which is not prone to manipulation.

The kinds of ratings we see today in different forms are not with the guarantee or a trust factor attached to it. Also, there is no way we can check the authenticity of the parameters displayed on the screen. Sales & Marketing are mostly focusing on taking advantage of human psychology and can manipulate data to increase the sale. And that's the flip side we all are facing in this capitalized world. So, by providing a platform to capture correct and real feedback and removing the intermediaries who can tamper with data, the pressure will be formed on originator to improve the quality of the product or services and not focus on increasing the sales by other means.

We make our choices by looking at ratings and reviewing user responses and it has become part of our lives today e.g. Books, Films, Drama & Art, Restaurants, Hotels, Financial Products, White Goods, Electronics, etc.

Inherent challenges in current ecosystem

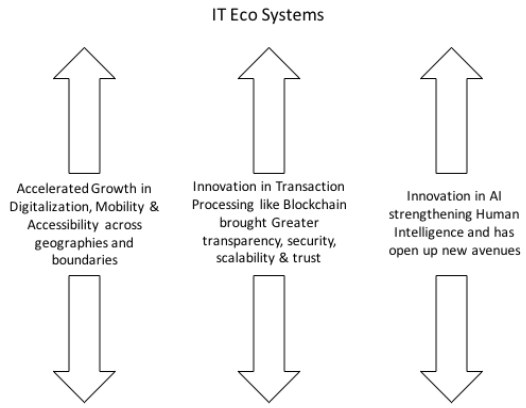
1. Owned and performed by groups or centralized custodians
2. Isolated and Focused to address specific needs and no flexible universal platform available
3. No visibility in the end to end processing mechanism
4. Different rating mechanism and means of interpretation
5. All stakeholders are not correctly incentivized to encourage fairness in the overall assessment.
6. Limited data size, coverage, and reach
7. Tamper and error-prone
8. Greatly constrained by the technical challenges of centralized storing, processing, sharing, and analyzing it
9. Fundamental problems in processing like ubiquity / accuracy / authenticity / cost-effectiveness / reliability are still unresolved
10. Relying on the limited user feedback/reviews/surveys/estimates and expertise required in assessment

In a nutshell, today ecosystem is facing three major frictions in global market

- Availability of Information (Imperfect, Insufficient, Inaccessible and Information risks)
- Interaction Effectiveness (Transaction costs, Degrees of separation, Inaccessible marketplaces, Difficulty in response Consolidation, Maintain Transparency),
- Innovation (Institutional inertia, Restrictive regulations, Invisible threats)

What are we proposing through URS?

We can leverage the new technology innovations like Blockchain, AI, and its ubiquitous availability to overcome challenges in the current system. URS is a universally available platform that simplifies the whole assessment process by bringing trust factor and reliability in the feedback mechanism which would eventually transfer the onus back to the product owner. It also focuses on democratizing the whole assessment process and provide a unique platform to incentivize all contributors to the system.



Data and Data Flow is equally important as Algorithms required to achieve a reasonably accurate quality rating of any product. Data will be the new currency.

This is like a classic chicken and egg dilemma. Algorithms need data to work, yet algorithms enable you to do whatever you want with data. However, the design of an algorithm is guided by the data structure they are supposed to work with, so data is more important than the algorithm.

Why Blockchain is considered?

Blockchain can be extremely powerful in its ability to overcome above three frictions and bring efficiency, trust and reliability. They are not simply a modern database replacement; they bring the most value as a shared system of record. The key factor is decentralized storage with security aspects covered.

In crony capitalism, profit is the prime motive and centralized custodians have always failed to bring required trust factor and transparency in transactions. For any online marketplace claiming authentic review and ratings, it cannot hold true for long as they do need their suppliers to stick and able to make a profit on their site. And they do it by hook or by crook. It is that the whole ecosystem that requires a change.

Blockchain is fundamentally revolutionizing asset/value transfers, it can very well be used for revolutionizing current feedback/review life cycle required for rating and assessment.

Blockchain, the technology underlying distributed ledgers shared across a scalable group of individuals and institutions, takes a new approach. Data associated with every event or transaction is time-stamped, appended to the record preceding it, and available to authorized participants in real-time. Individuals can't tamper with records after the fact is captured; records can be amended only by agreement among participants. In this way, data becomes part of a reliable, unbreakable chain of trust. Its distributed architecture assures that applications can be fully interoperable, and span both industries and ecosystems.

What AI can do?

Assessment and Rating require advanced mathematical modeling, algorithms that can work with huge data set to generate intelligent output which also requires advance computational & AI capabilities to improve the accuracy of the rating. AI, in this case, includes advanced data science and big data capabilities as well to develop various techniques for assessment.

2. Objective

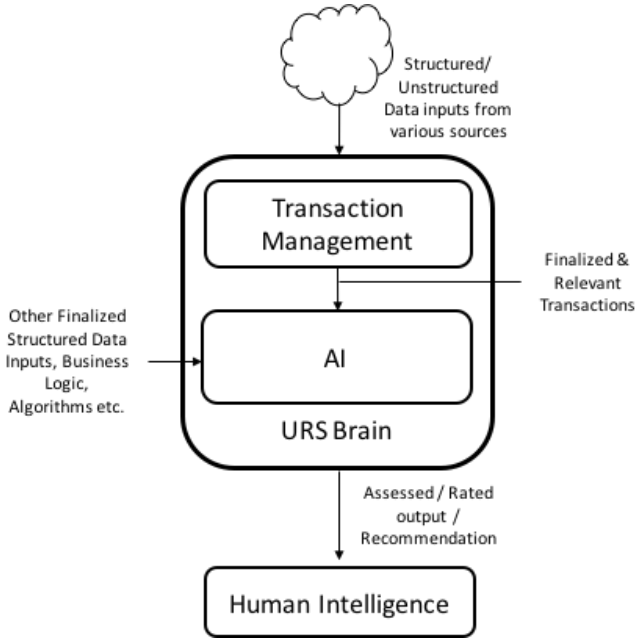
The objective of this document is to set the theoretical basis of the universal platform and come up with a feasible approach that can be converted into an MVP.

The current scope of this project is to provide a feasible solution for the end consumer products/services/commodities where user feedback plays a major role. However, in the future based on the implementation efficiency, this can be extended to the more sophisticated & specialized complex rating assessment. Like the work being done by established rating agencies & large organizations i.e. Credit rating, rating of Financial instruments. Esp. in the area where the dataset is large, complex Also, there is certainly the scope for having final rating/recommendation coupled with predictive analysis which Machine Learning can provide.

3. URS

It is a PaaS (platform as a service) that is a generic and open stake platform. A highly configurable and autonomous in terms of how data will be collected, how assessment logic will be applied, and how final assessment will be consumed.

3.1 Concept Platform



URS Brain

Core Modules

- Blockchain enabled transaction processing
- Rating & Assessment through AI Techniques

Associated Modules

- User Interfaces to collect & manage input data
- Sandbox for development & testing of pluggable techniques required for entity specific assessment and rating
- URS SDK Library
- Rated Output management

Blockchain and AI are the core underline architecture components of the URS to generate universal rating for any product or service.

URS interfaces are customizable and flexible for various needs and requirement however its core logic of transaction processing and utilization of AI for data analysis is internal and protected / governed by core team.

Key URS Interfacing Modules:

- Stakeholder Management
- Asset/Product/Entity Management
- Assessment Management
- Technique Management
- User Interface management for data collection e.g. Mobile, Web, APIs etc.

The configurable modules would be

a. Stakeholders on-boarding
b. Entity/asset parameters and configuration
c. Data collection methods and channel integration
d. Data replication & off-chain DB
e. Data assessment and analytic techniques to be used
f. Deciding rating scales and qualitative indices for specific product or services.
g. Aggregation / interpretation and correlation of assessment

There can be multiple data input channels to finally correlate and decide the rating of any entity or parameters. Likewise, there can be multiple techniques that can be applied for the rating of particular asset/entity.

The most important input channel is end-user feedback/review data collection. User / independent stakeholder feedback is captured through Blockchain transaction processing. Other common institutional or research feedback may directly be plugged into the AI engine for final rating calculation.

Although URS will have its standard interfaces for all workflow components, there can be a robust API Lib. as well for other external sites to integrate with and have their own custom UI/UX.

Rating parameters and criteria vary depending on which entity we are planning to rate so there is a requirement to have pluggable assessment logic and flow that can be fed into the rating system.

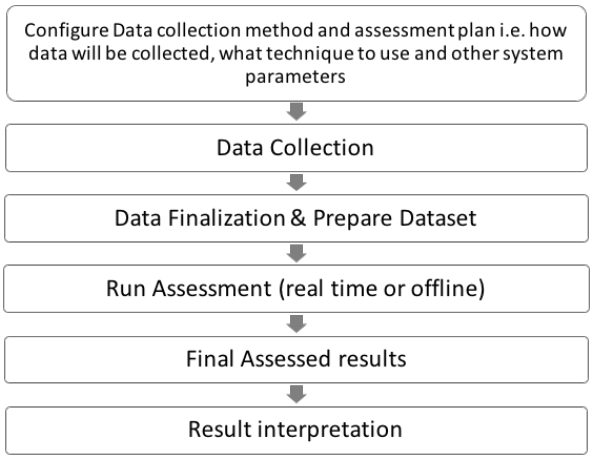
Sandbox: Sandbox will be the area where developers, data analysts, data scientists, or

research analysts can test the new mathematical/statistical models or algorithms or estimation techniques using URS SDK which can then be deployed to production and available for runtime assessment.

Numerous scholars have worked and published many thesis/whitepapers/articles/research papers to touch different aspects of assessment & rating. And many data scientists are working on this specialized job. They have developed multiple algorithms to predict better / accurate assessment for online products/reviews/user feedback. Some of the references are mentioned in the reference section. The sandbox provides a working platform for them to test and take up their new approach to the world.

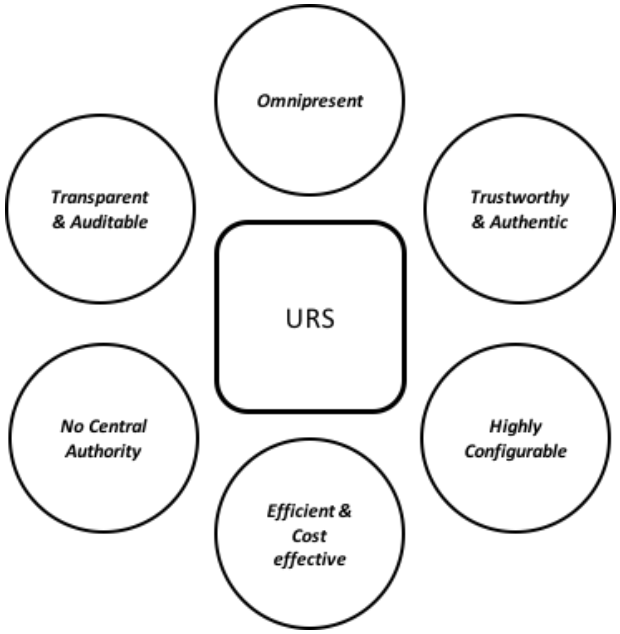
Sandbox is the playground where developers can test and fine-tune their techniques.

High level process workflow



Some of the URS Benefits but not limited to

- Transaction recording and storing is not centralized and having benefits of distributed system and database.
- It is not owned by some central institution or entity
- It will bring tremendous efficiency in the ecosystem with very little overhead for feedback collection, integration, storing & management of it readily available.
- Brings absolute trust in final rating as records are immutable, and stored securely
- Scalable and one would just need to work on the feedback acquisition and final interpretation of the rating
- Autonomous and requires very fewer management efforts
- Smart contracts, certifications, and digital compliance on Blockchain networks will codify trust at the level of the individual transaction.
- Today, online rankings and ratings are proxies for trust. The kind of reputation systems built on blockchains will serve as a permanent record of an organization's or individual's behaviour. Ledgers, the system of record become a robust record of trust
- It provides a secured platform for greater collaboration
- Real-time view of History and records
- Automatically Incentivize all contributors



3.2 Open Architectural Decisions

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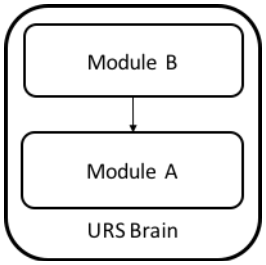
3.3 URS Brain deep dive



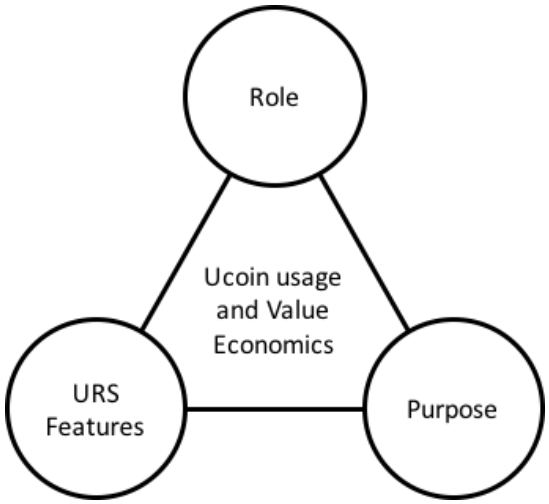
Module B Deep dive

To define the analogy, Module B plays the role of the cerebral cortex of the human brain which collects, integrates & converts information into meaningful data. As stated earlier, Input data (mainly end-user feedback) travels through a public chain of URS Blockchain network to create a final dataset for further analysis

Introducing Ucoin

URS Public and Private chains will introduce Ucoin utility token as their internal token currency which gets transferred between stakeholders based on a smart contract. For example, end-users will get Ucoin providing feedback likewise all researchers and data analysts will receive Ucoin for providing proven techniques for accurate assessment of datasets. The value of Ucoin will be decided based on the intrinsic token economics of the URS network. Also, the generation of new Ucoin will be based on certain conditions. Ucoin will be freely tradable on cryptocurrency exchanges. The sole purpose of Public Chain is to collect enough data required to assess the entity and make the platform truly universal.

In a highly autonomous and self-sustained model, it is very important how & what to incentivize the stakeholders participating in the network continuously. Ucoin Economics talks about the same



Role: Roles are the type of stakeholders interacting with URS for different purposes and use different features of URS.

Purpose: There is a different purpose behind each feature of URS

URS Features: A list of different functions available require performing various operations on URS

Token value economics is designed considering above three aspects of URS

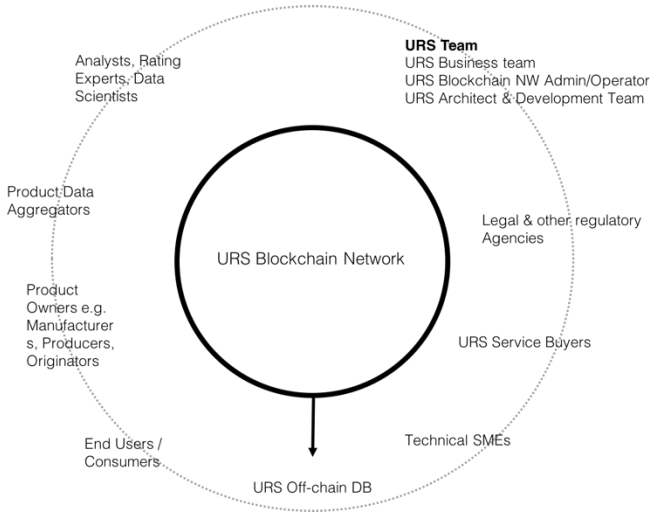
Token will entitle each stakeholder to use the service of the platform and get incentives for all significant contribution

Various Roles & Purposes:

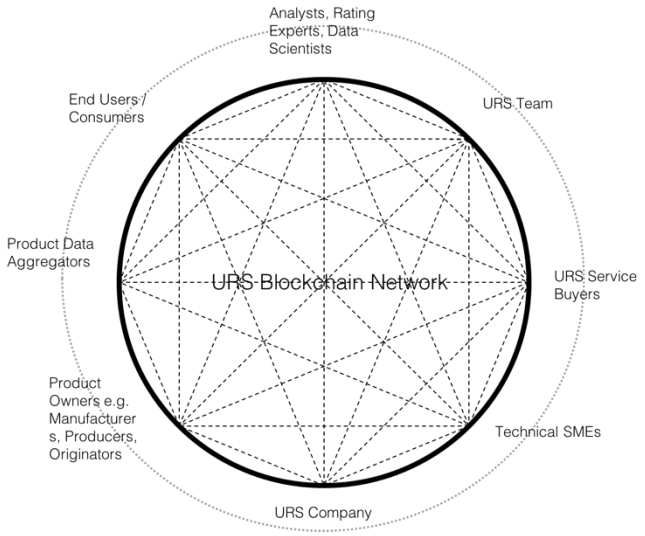
- Manufacturers / Originators / Producers list their products seeking quality ratings to improve their competitiveness in the market – this can be a bought review for the new products in the market
- End Consumers provide feedback or individual rating for specific products
- Aggregators are the independent critics or expert or simple aggregated response for multiple products (expert review by testing various peer products or services)
- Technical SMEs and Developers develop and publish various techniques

- Data Scientists / Analysts / Rating experts to work on data and rate assets based on various analytical techniques
- Reviewers reviews various techniques, experts, analysts, & final product rating published by various Analysts and rate them as well
- URS Service Buyers are all such users (including product owners) looking for final rated output available in system viz. any institute, business houses, rating agencies or anybody, online marketplaces

URS Business Network



Ucoin Token Stakeholders



Module A Deep Dive

To continue with the analogy, Module A is like hemispheres and other parts of the brain which perform cognitive functions. In our case, it is the SDK & API library to develop various assessment techniques and runtime environment to execute those techniques.

Technique developers can use various APIs and functions including AI services to prepare their specialized model and techniques which will be published and deployed to production for Assessors to use.

3.4 Hypothesis

Hypothesis of a simple rating use case

Entity: The Entity is the uniquely identifiable object or product required to be rated. It can be any tangible or intangible asset or mere a piece of information. In other words, a unique digital identity of anything that is required to be rated or its rating to be tracked

e.g. the set of entities that have been rated

Set E = $\{E_1, E_2, E_3, \cdots, E_n\}$

User: User is an individual who expresses an opinion, response or provide feedback against predefined scale or in simple text

e.g. set of users who all have provided feedback for one or more entities

Set U = $\{U_1, U_2, U_3, \cdots, U_n\}$

Metric: Predefined scale to collect feedback. It is an optional attribute i.g. {1 = "poor", 2 = "good", 3 = "excellent"}

e.g. super set of all metric scales

Set M = $\{M_1, M_2, M_3, \cdots, M_n\}$

Transaction: transaction is the processing of the data input which will be captured, validated, exchanged & finally committed or stored.

For specific E_i Users select any one rating for that Entity so there will be a matrix formed with values or records

$$A = (t_{ij}) \in R^{m\,x\,n}$$

where m is all users and n is total available scales

Dataset: dataset is a collection of data values or records which will be passed to rating functions for assessment to generate final output

The relation R from set E to set U is the set of pairs where any one entity is rated by multiple users. It is one to many relationship

Therefore, $R = \{(a,b)/a\varepsilon E\ , b\varepsilon U\ and\ aRb\ \}$

Hence,
Domain (R) is the set of all the elements 'a' of E, which are related to some b in U
Range (R) is the set of all those elements 'b' of U, which have fall back to 'a' in E

Also, $Domain\ (R) \subseteq E\ and\ Range(R) \subseteq U$

Similarly, there is a relation between Entity Set E with Transaction Matrix $A = \left(t_{ij}\right)$

Therefore, $R = \{(a,b)/a\varepsilon E\ , b\varepsilon A\ and\ aRb\ \}$

Hence,
Domain (R) is the set of all the elements 'a' of E, which are related to some b in A
Range (R) is the set of all those elements 'b' of A, which have fall back to 'a' in E

$$Ai = (Aij)\ \in A$$

Dataset Ai is the final set required to rate Entity Ei

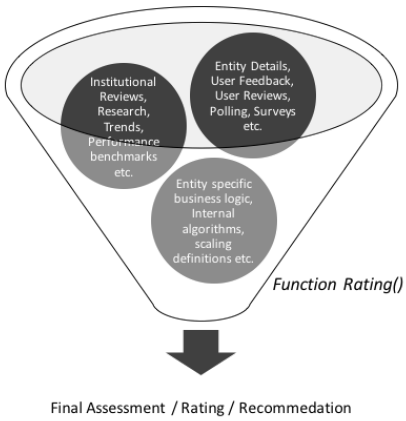
Technique: Technique is the unique program or procedure or algorithm or piece of code required to run assessment. This can be a class, or an object like in OOPS that can be inherited and used in Rating function

Set Tq = $\{T_{q1}, T_{q2}, T_{q3}, \cdots, T_{qn}\}$

i.e. Tqi is the unique identifier of the program or object

Rating Function: Rating holds the overall business logic and takes inputs required for the assessment. It works on dataset to generate desired output

$$Function\ Rating(Set\ A_i\ ,* T_{qi})$$



#Functional representation and not the actual technical implementation

More precisely Rating () is the function to make use of expert estimation technique for specific entity and result of real voting / feedback to make rating closer to "ideal choice". It can be based on analysis of pure user feedback or combination of various data feeds / parameters required for assessment.

4 Other Use Cases for POC

Use Case 1

(Ref.4. Paper Mathematical Modelling of Product Rating: Sufficiency, Misbehaviour and Aggregation Rules)

Target current online ratings available on online systems like Amazon, eBay, Flipkart etc. in which ratings are interpreted as product quality assessment

Although there is wide deployment of product ratings in web services, people only have partial information on these ratings: each user only expresses ratings to a small subset of products. Hence, it is important to understand the" accuracy" and" effectiveness" of online rating systems.

Collect the historical ratings of various products on these sites.

Apply common techniques / rules like a. Majority rule b. Average Scoring rule c. inference algorithm on dataset

Compare, explore & interpret following questions with results

(a) What is the minimum number of ratings a product needs to have a reliable reflection on its quality?
(b) How users' misbehaviour may affect the accuracy?
(c) come up with a new mathematical model

Use Case 2

Real-Time Bayesian Parameter Estimation
for Online product ratings

(Ref.6. detail paper Real-Time Bayesian Parameter Estimation for Item Response Models Ruby Chiu-Hsing Weng∗ and D. Stephen Coad

Use Case 3

Plan a survey for any new interesting product item and collect user responses

Use Case 4

Apply Technique for Sentiment Analysis and Rating for user reviews (Ref. whitepaper, Triple Non-Negative Matrix Factorization Technique)

Use Case 5

Characterizing Product Lifecycle in Online Marketing: Sales, Trust, Revenue, and Competition Modelling. Analysing the patterns of sales and interesting correlations of sales with the ratings. Also the impact of trust on revenue figures (Ref. research paper by Santosh K C and Arjun Mukherjee mentioned in reference section)

Use Case 6

Define any news headlines by various frontline newspapers as digital asset to be rated. Use URS to collect user feedback and review for authenticity of the headline and generate final rating.

5 Market Research

There are enough products, initiatives & efforts made in this area. However, the main differences found in implementation and the target objectives. There is no truly ubiquitous and generic platform available in market which can be used as a service model and having multitenancy attributes.

There are silos and vested efforts seen in this segment by different companies and IT product and solution providers. Yet, none of these organizations can ensure entire chain integrity by creating a stand-alone solution due to centralized logic of data collection and sharing. Also, not truly universal in nature.

Some noteworthy review sites but not limited to

- Angie's List
- Epinions
- Yelp, Inc.
- ConsumerAffairs.com
- Judy's Book
- Zagat
- TripAdvisor
- Glassdoor
- RateMyProfessors.com
- RateMyTeachers.com
- Trustpilot
- SiteJabber

However, all of them are facing multiple one or other issues and plagued with inherent challenges described above. Success criteria for any review site is into the implementation of that trust factor.

Gartner:
Top 10 Strategic Technology Trends for 2018
Published: 03 October 2017 ID: G00327329
Analyst(s): David W. Cearley | Brian Burke | Samantha Searle | Mike J. Walker

The intelligent digital mesh is a foundation for future digital business and its ecosystems. To create competitive advantage, enterprise architecture and technology innovation leaders must evaluate these top trends to identify opportunities that their organizations can exploit.

Trend No. 1: AI Foundation
Trend No. 2: Intelligent Apps and Analytics
Trend No. 3: Intelligent Things
Trend No. 4: Digital Twins
Trend No. 5: Cloud to the Edge
Trend No. 6: Conversational Platforms
Trend No. 7: Immersive Experience
Trend No. 8: Blockchain
Trend No. 9: Event-Driven Model
Trend No. 10: Continuous Adaptive Risk and Trust

Top 10 Strategic Technology Trends for 2017: Conversational Systems

Published: 21 March 2017 ID: G00319579
Analyst(s): Brian Burke | Tom Austin | Samantha Searle | David W. Cearley

Summary
Conversational systems will bring the next paradigm shift in IT as technology becomes people-literate. Enterprise architecture and technology innovation leaders must exploit the viable use cases today while exploring opportunities for conversational systems in the future.

Conversational Systems Is a Top 10 Trend

- Changing the Way People Interact with Technology
- Conversational Systems Will Be the Next Paradigm Shift
- Evolving to General-Purpose Platforms

No Similar Product / Application / Technology platform found on Gartner Magic Quadrant Ratings

There is a detailed research work covered in another document as supplement.

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10. 34% consumers say their low product ratings have not been published by eCommerce sites *https://www.localcircles.com/a/press/page/fake-product-review-ratings-on-ecommerce-sites-survey#.Wn1_yI763-A*

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