

Improved Trust Worthiness in Electrical Energy Management using K-means Augmented Blockchain Technology

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Presenting :

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Outlines to be Covered

- Introduction
- Literature review
- Research motivation
- Our approach
- Results
- Conclusions
- References

Introduction

- The goals of an energy management organization can be categorized as
 - Provision of value added services
 - Generation of profits

Business Goal	Business Process
• Supply customer with electricity	• Customer electrification 
• Satisfy load increase	• Network reinforcement/extension
• Ensure safe and continuous network operation	• Network operation 
• Improve exploitation of company assets	• Exploitation and maintenance of company assets
• Ensure positive profit for services provided to customers	• Customer billing 

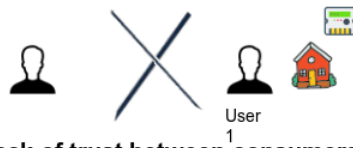
Introduction (cont)

- The expectations of electricity consumers include
 - Delivery of satisfactory service
 - Affordable billing rates for electricity usage
- Do the goals align between the utility companies and the users in our environment ???

Introduction (cont)



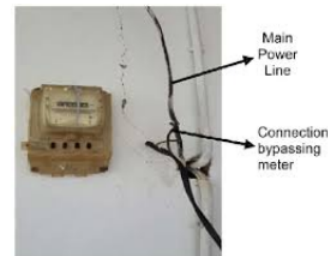
Outrageous estimated billings
Source (<https://nextedition.com.ng>)



Lack of trust between consumers and utility companies



Illegal connections
Source (<http://www.ebru.co.ke>)



Meter bypassing
(Hussain, Z., Memon, S., Shah, R., Bhutto, Z. A., & Aljawameh, M. 2016)

Literature review

TOPIC AND AUTHOR	SOURCE AND YEAR	CONTRIBUTION
BITCOIN : A PEER TO PEER ELETRONIC CASH SYSTEM. (Nakamoto, 2008)	Bitcoin.org, 2008	This paper introduced the concept of bit coin and blockchain. It also explained the workings behind the Proof of work consensus algorithm.
Blockchain technology in the energy sector : A systematic review of challenges and opportunities (Andoni, et al, 2019)	Renewable and Sustainable Energy review, 2019.	This paper reviewed 140 blockchain research projects and startups and highlighted the potentials of blockchain in the energy sector
GridMonitoring: Secured Sovereign Blockchain Based Monitoring on Smart Grid. (Gao, et al., 2018)	IEEE Access, 2018	This paper proposed a smart-grid which uses blockchain to ensure a secure record management.
An E-voting Protocol Based on Blockchain. (Liu & Wang, 2017)	IEEE Access, 2017	This paper uses the properties of blockchain to model an e-voting system that will be secured from external manipulations

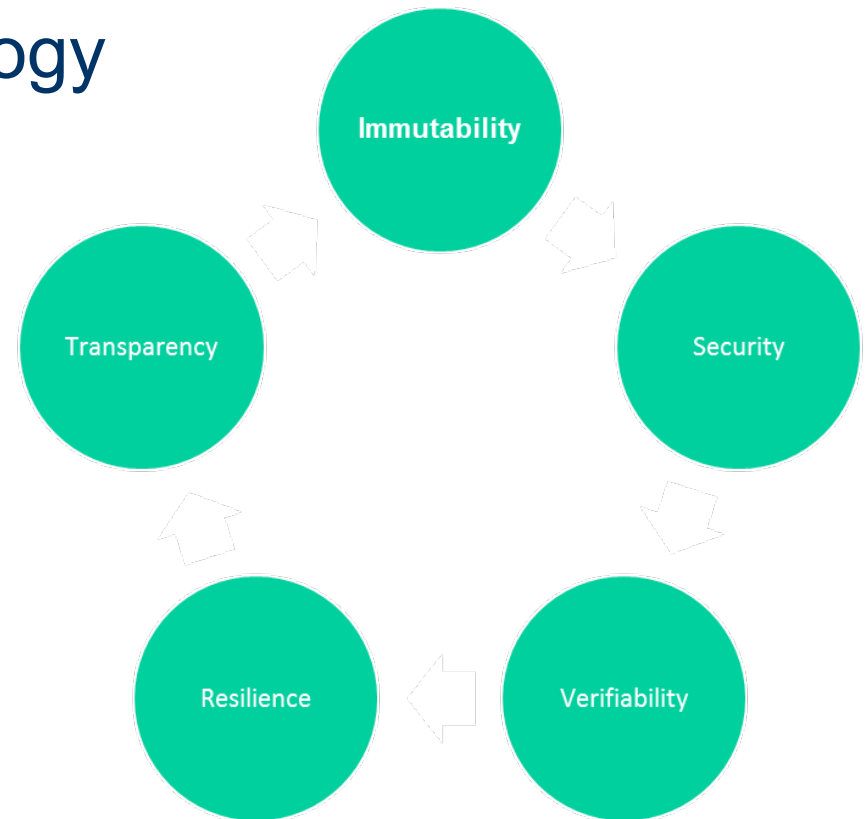
Research Motivation



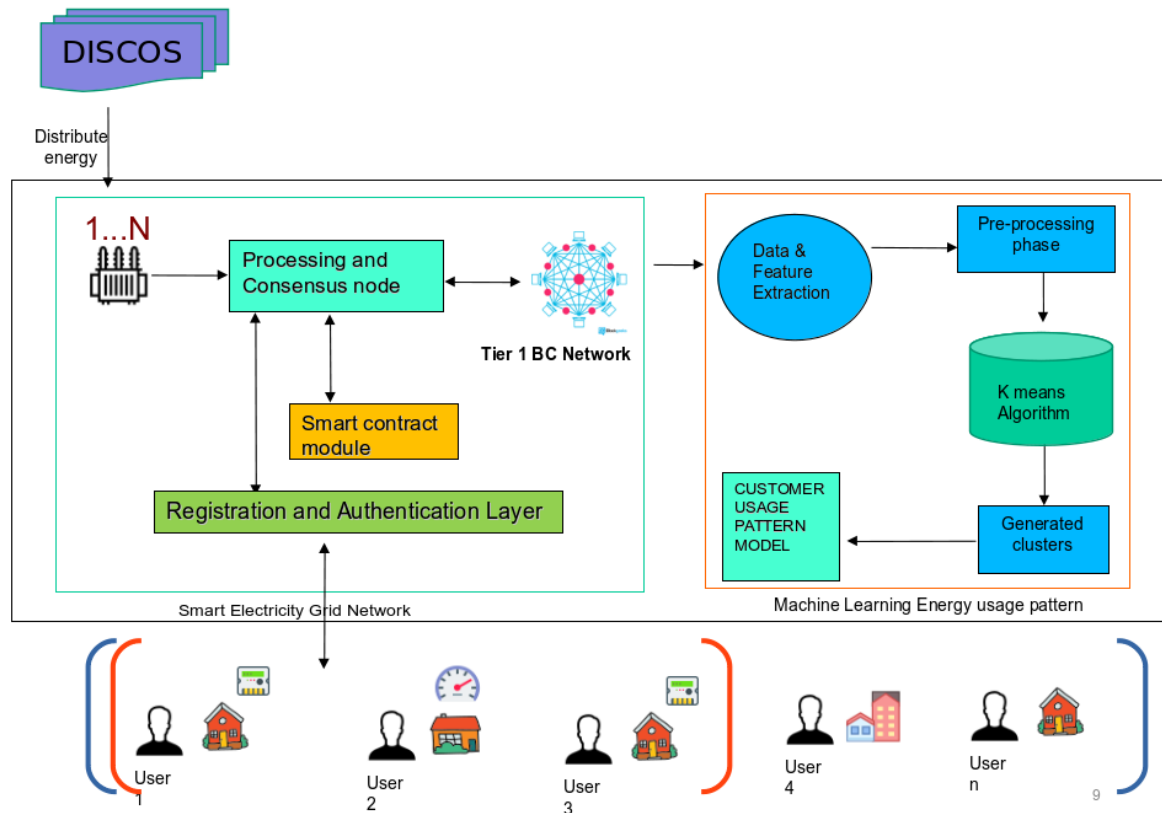
- Address the perceived notion of unsatisfactory service delivery
- Enhance customer confidence
- Data analytics

Project motivation- solutions

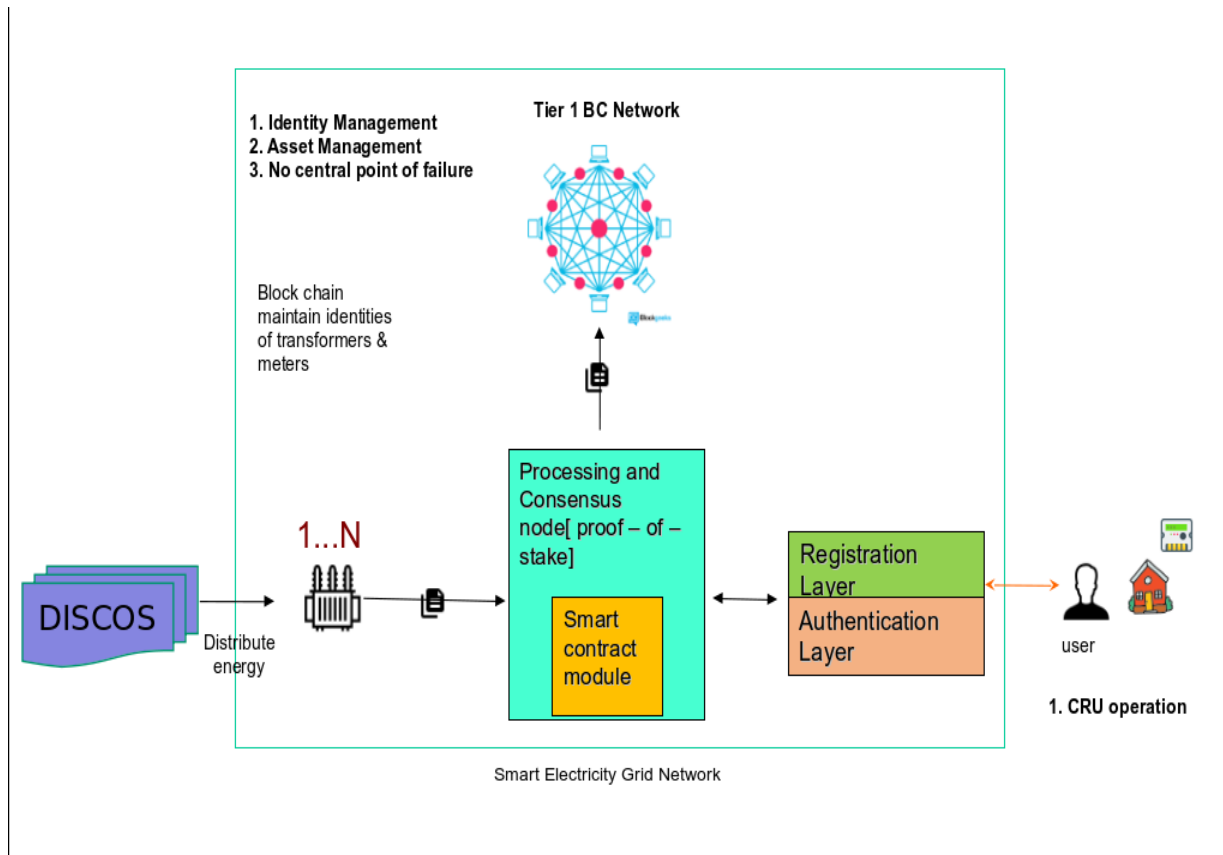
- Blockchain technology
- Machine learning



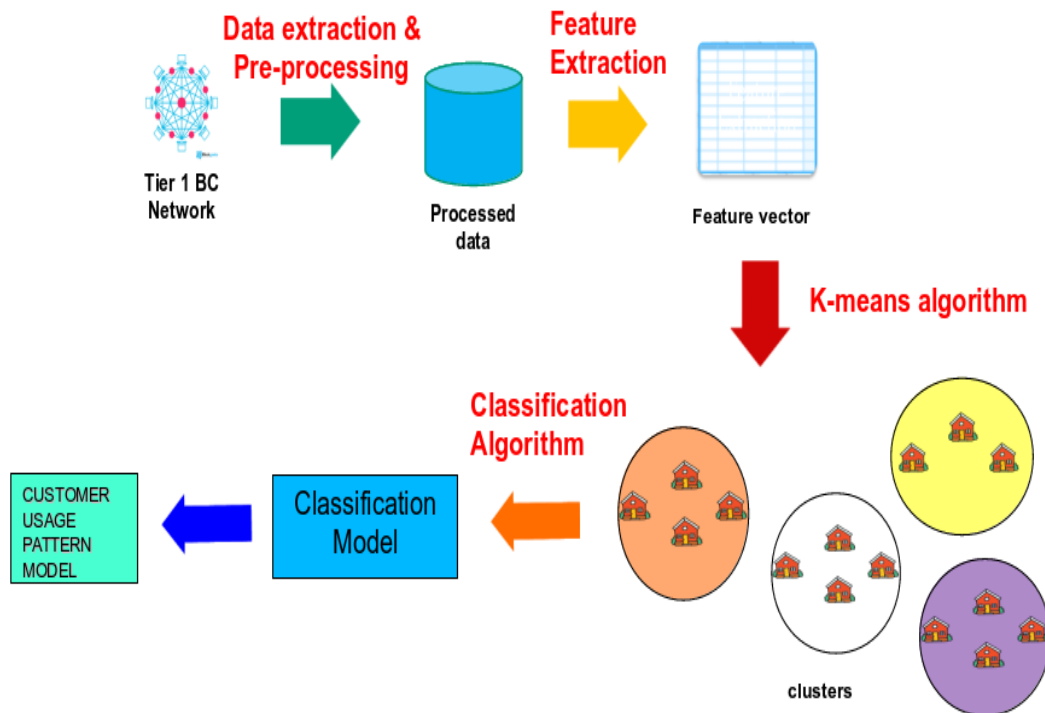
Our Approach: Data collection/aggregation phase:



Our Approach (cont)



ML phase



Results



This model was experimented on the Ethereum blockchain framework.

- 2362 consumers' daily electricity data between July 2009 and April 2010 considered for the scope of the work

Results- Identity management

[illegible]

Results- Meter readings

[illegible]

Results- Clustered users

	total KW mean	average per day mean	% Monday mean	% Tuesday mean	% Wednesday mean	\
cluster						
0	14445.025133	26.949674	14.083309	14.197316	14.092767	
1	31757.107918	59.248336	15.775249	17.971579	17.626609	
2	0.000000	0.000000	0.000000	0.000000	0.000000	
3	167954.714598	313.348348	14.708088	15.289721	15.156290	

	% Thursday mean	% Friday mean	% Saturday mean	% Sunday mean	% weekday mean	% weekend mean
cluster						
0	13.997043	14.082547	14.715718	14.831300	70.452982	29.547018
1	17.305410	16.117066	8.932580	6.271506	84.795914	15.204086
2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3	15.205475	14.912907	12.716175	12.011345	75.272480	24.727520

Conclusion

This study showcased the capability of combined blockchain technology with k-means algorithm in effectively eliminating

- Energy theft
- Over-billings
- Enhanced trust among consumers and the service providers
- Intelligent usage reportings

References

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A decorative graphic on the left side of the slide, consisting of a light green L-shaped block at the top left and a dark blue horizontal bar with a rounded left end extending across the middle.

**Thank you
for your
attention**