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IoT Hand-held Computing Device over Personal Computer at Milk Procurement center

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Executive Summary

This document aims to outline the prevalent usage of underutilized personal computer at milk procurement centres which looms with several problems. A milk procurement centre [1,14] for any dairy union is located in the hinterlands of rural area. The main concept of entire procurement centre is to perform some basic operations of milk and farmer analysis by the application stored in system associated with different equipment like milk analyser, stirrer, weighing scale, printer, scanner, remote display unit etcetera integrated with the application. A personal computer is far more computational device which is required in higher end operations (like entertainment, social networking, and data analysis etcetera) [8]. Although, in milk procurement centre it is highly under- utilized and the cost with which it is purchased to deploy at such centres does not serve the purpose. Mostly personnel deployed at such procurement centres are not well equipped enough to manage the application on personal computer resulting in delay of milk procurement process. This not only affects dairy companies, but also dairy farmers who are long waiting twice a day for their milk pouring affects the quality of milk as well as payments.

A personal computer (PC) suffers from the problem of taking data from system manually and delivering to dairy companies for any further analysis or matching data. Personal computer does not have built in GPRS/GSM system which can take command or instruction or any changes from remote or any centralized location. Neither does it have the capability of sending data to the cloud. So each time a person needs to travel for change of system configuration. Also with delayed milk procurement process, even milk analysis data takes time to reach dairy companies for any decision making. This not only seizes away the opportunity to take timely decision action to resolve near-real time issues, but also results in delayed integration with banks for farmer payments, as no cloud solution or IoT (Internet of Things) [7,11] can be integrated in a personal computer procurement system without any hardware change. This entire chain of repeated delayed process results in below optimal operations, increasing time to market for dairy products. This results in delayed price realization by farmer and dairy companies.

With more than 3, 00,000 collection centres [2, 3] (more than post offices in India) meant for milk procurement across different milk societies, it becomes quite imperative for the collection units to be modernized with time. Conventional personal computer based system do not fulfil the optimised working capability for operators with heavy training costs involved and vendor dependencies as subsequent operational costs which can be man-handled and tampered with. With each personal computer original Microsoft windows license, which is roughly 8,000 [18] is required. Conservative estimate of even 50% collection centres purchasing it would give an average amount of 120 crores. This much money is earned by a foreign company of which not even miniscule percentage is utilized in these procurement centres.

Need of the hour is to move further with IoT hand held computing device which are embedded with GPRS/GSM enabled system and connectivity through cloud based analytics solution. All additional operations like profit & loss, inventory management, feed-fodder management, animal insurance service, membership management and etcetera can be extracted through cloud.

Our honourable Prime Minister's PMJDY [17] work, seamless integration of banks and farmer payments system can be done via IoT hand held computing device operating through cloud. It has the power to strengthen milk procurement systems [1, 14] across length & breadth of the country.

Context of Milk Procurement in India

Dairying is a source of income for millions of rural milk producers [13], which contribute towards strengthening the livelihoods of small holder milk producers who form majority of India's milk production system. In a market driven economy, it is all the more important to have producer-centric institutional structures that strictly conform to cooperative principles and provide rural milk producers a greater access to the organized market.

A milk-shed area is the geographical region from which a marketing agency secures its fluid supply. The size of the milk shed area is primarily determined by the demand of the dairy plant. The larger the dairy plant the larger the milk shed and costlier the supply. The number of milk collection centre, the number of milk producers pouring milk at the collection centre, distance of milk collection centres, price paid by different milk procurement agencies, regularity of payment are the other considerations that determine milk procurement.

The organized dairies collect milk through one or combination of the following systems [18]:

- i. Direct System: In this system dairy company collects milk directly from the producers by establishing its own village procurement centres. The milk producers deliver their milk supplies at the collection centres. The payment for milk to the milk producers is made according to pre-specified rate based on quantity and quality of milk supplied.
- ii. Agent System: The dairy company appoints agents to procure milk in the specified area. Payment for the milk is made directly to the producers while the agent gets the commission on pro-rata basis.
- iii. Contractor System: The dairy company purchases milk from the contractor according to terms of the contract. The details in respect of quality, quantity of milk in the flush and lean season, price and the payment etc. are specified in the contract.
- iv. Co-operative System: The dairy company accepts milk from Milk Producers Co-operative Societies (MPCS) established and functioning at the village level. The milk producers in the

villages give surplus milk to MPCs. The payment for milk is made according to quality and quantity of milk. The rates for fat and SNF are made known to the milk producers.

The co-operative sector has made tremendous progress in the organization of dairy co-operatives at the grass-root level in the villages and milk procurement in sizeable quantities. The extent of their reach can be judged from the number of dairy co-operatives, their membership, quantity of milk procured and sold in different states under the co-operative sector.

It is made clear at the outset that the dairy companies in the co-operative and public sector domain have adopted dairy co-operatives structure as a system not only for milk procurement but also for dairy development as well. It may be emphasized that no city dairy can function properly unless it is linked up with a proper milk procurement organization preferably located at a distance from the urban consumption centers. Dependable sources of milk supply would be distant milk production centers rather than close pre-urban areas.

The milk producer's interests shall be served best when he gets remunerative price for milk, the payment is regular and timely, and incentives for higher milk production like availability of veterinary services free or at a nominal cost, readymade feed mixture at subsidized rates, supply of improved seeds and other technical services are provided to him.

Challenges

Personal Computer based solutions are prone to several malpractices as operator or other users can run in different applications in system apart from milk procurement application. Dairy farmers suffer as they get pretty delayed payments for their milk poured and even due to delayed milk reaching the market. Dairy companies as well experience the price fluctuations and delayed product to market with delayed price realization [9]. In this entire chain nation suffers when huge investment via subsidies and government loans are being granted [15] to make dairy industry responsive and technologically upgraded.



Another problem with the personal computer based system is the requirement of several connecting wires, which is prone to a lot of connectivity issues due to loose connection. As a result, the work gets hampered making the procurement process or even stagnant. Operators in procurement centre are not well equipped to handle such situation and resume procurement process without any delay. These systems ask for manual up-gradation and timely maintenance for its effective working.

On the other hand, the hand held systems in collaboration with cloud analytics and IoT require much less maintenance and get auto-upgraded via push system through cloud. Dependency reduces considerably when it comes to hand held system as it ensures for end to end connectivity which suits to cater the concerned dairy company procurement centre requirement and is easily customizable from time to time as and when required.

The usage of a personal computer based system is very low taking into consideration that the investment on the system is on a higher side. Milk reception handling and maintaining inventory data can be administered through hand held devices.

The hand held systems cost considerably lesser than a personal computer based system. The details of the cost involved can be referred from the *Table 1 as below:*

Personal computer based system		Hand held system	
Ite	Pri	Ite	Pri
Personal Computer	30,000	Hand-held device With gateway	21000
GSM Dongle	1,500		
Operating System	8,000	Operating system	Not required
Anti-Virus (For 3 Years)	1,800	Anti-Virus	Not required
Dot-Matrix Printer	10,000	Thermal Printer	3000
Total	51,300	Total	24,000

In Personal computer based procurement system there is incremental cost of UPS as higher rated battery power is required. Also, the transportation costs too get higher in this scenario making the total cost for PC system further up. Considering the above stated conservative costs and even additional costs IoT hand held procurement system comes at half the cost of



conventional personal computer based systems. With present number of collection centers (CCs) currently in India, if, Hand held system are deployed even in 50% CCs, there can be a saving (considering total costs for PC based system as 54,000 and Hand held system as 25,000) of 435 crores. Such sizeable investments can be utilized otherwise for making dairy industry productive on technology end. Even, if a fraction of it, passed to farmers, would help them scale up their milk production as well as quality aspect too.



Figure 1: Hand-held device based milk procurement system



Figure 2: Personal Computer based milk procurement system

Proposed Solution

The Internet of Things (IoT) [6,10] is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Introduction of IoT hand-held computing device based Automatic Milk Collection Unit (AMCU) [14] which allows the operators to easily manage the milk procurement process, without manual intervention for money management and transactions, thus allowing transparent and easy transactions. The cloud part of solution facilitates to do the data analysis and storage, control and management by centralized rate chart push, centralized configuration management, dynamic rate chart management, analytics of various collection centre based on geographic hierarchy, even farmer level views for the entire milk collection activities.

Procurement system core purpose is to handle milk reception process in morning & evening and to update inventory data at collection centre level. Other processes like inventory management, feed- fodder management, and truck slip records, farmer records and payments analysis etcetera can be pushed to cloud and taken care of [4].

Hand held based milk procurement systems contributes to several parameters when it comes to neck to neck comparison over conventional personal computer based AMCU. Overall level of day to day and session wise working efficiency for operators as well as dairy unions increases manifold times. When at several rural locations getting optimum space for collection centre becomes a challenge, modernized hand held system hardly occupies much space even in a small centre. Moreover, a rural operator need not be highly proficient in computer literacy for it to operate well on hand held based milk procurement system and its easy navigation software solution.

This has a ripple effect of reduced operational costs on training operators and helps repeatedly. Even the sever dependency on external vendors reduces. Hand held device system ensures for



cloud operated data analytics which takes care of subsidiary services and management. With efficient analysis additional time consumed at collection centres is eliminated.

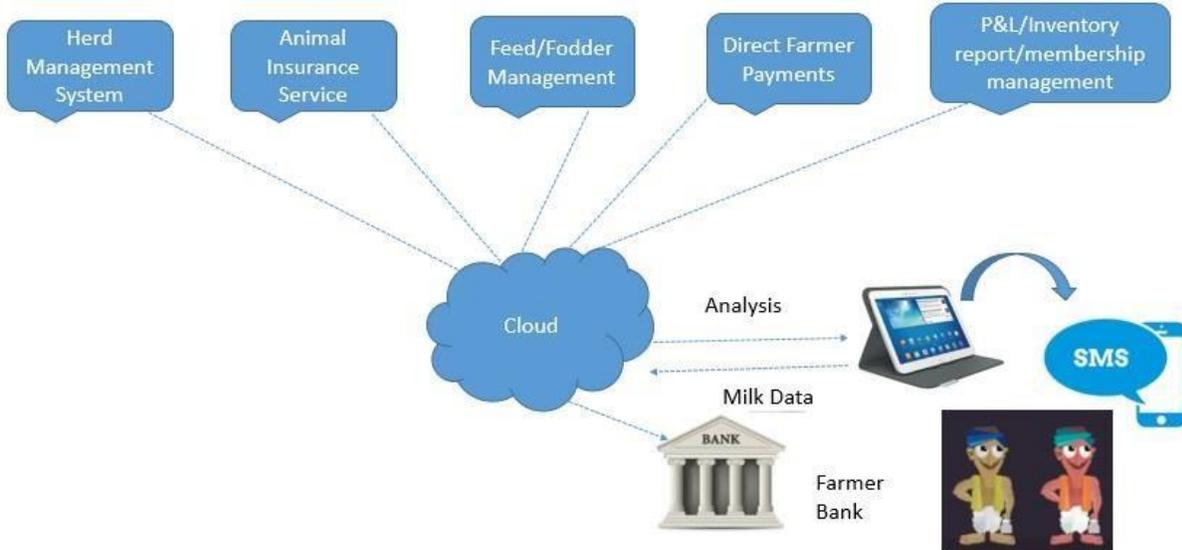


Figure 3: Secondary services mechanism via cloud

Hand held system ensures for GPRS/GSM lock enablement and only one custom application running on this system else it ensure it to be in offline mode. This helps to reduce any alternative usage and even enhance battery usage. Hand held miniature system being portable in nature and even light weight in entirety with software cloud based solution is almost hands free and reduces time lags between procurement processes. Even with easy payment system integrated with cloud analytics of hand-held device based system timely payments are adhered to; making cross-checks easy and further reducing time lags of payment process from dairy companies to individual farmers.

Entire architecture of IoT hand-held device based milk procurement system



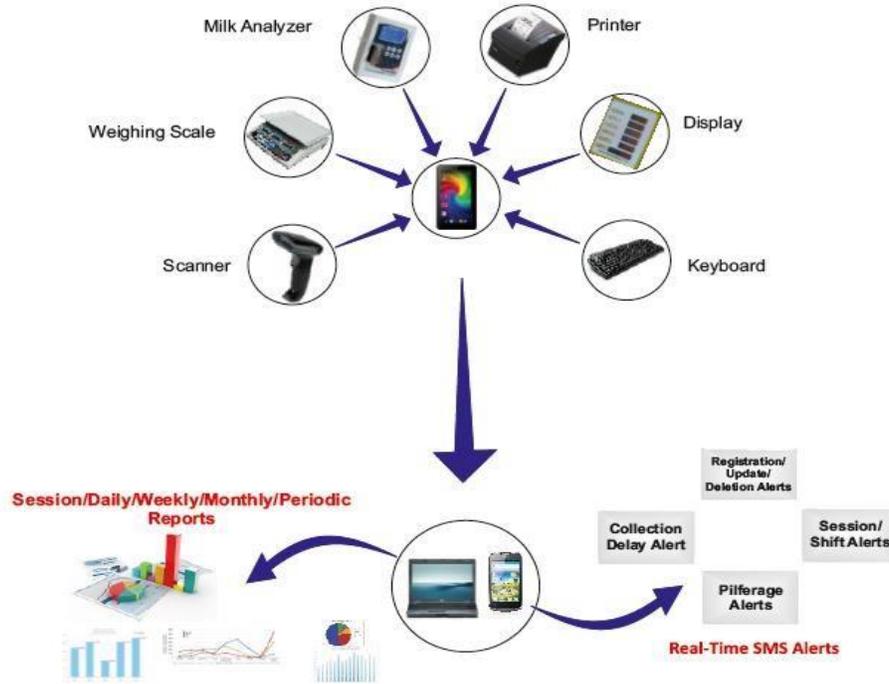


Figure 4: Working of IoT hand held computing device based Application

- Techno-business features by hand held procurement systems:
- Near zero touch operations
- Simplified milk collection process
- Automated data entry resulting quick data capture and data consistency
- Portable system for door-to-door milk collection
- Automated farmer identification (Using a unique ID)
- Real-time SMS & email alerts with procurement, lifting and correlated BMC data.
- Advanced reports and trend analysis.
- Provision of creating all possible combinations of rate charts.
- Central calibration and rate chart administration facility.
- Seamless MIS/SAP integration facility.
- Data back-up, remote support and maintenance & remote auto-upgrades.

Achievable Gains

Apart from less investment hand held system has many advanced features like usage of wireless network with cloud computing. Transferring milk reception data to cloud over wireless network can make the system more efficient and traceable. Hand held based system ensure for effective data transfer and hence data reliability. Software deployed on cloud ensures that data remains secure and is not been tampered or any manipulation is done. Data analysis and accuracy remains intact and ensures for hands free operation which is not possible in conventional systems. Entire system becomes much automated and brings in more transparency and easy flow of information in entire process with minimalistic intervention. In personal computer based procurement system rate chart is administered by local mechanism whereas in proposed system via any central location rate chart can be changed or pushed for different set of locations. This further ensures for less operational expenditure spent on changing rate charts at different locations or while adding new centres. Monitoring reliability of quality analysis by hand-held system works on trend analysis and data entry is fully automated.

IoT Hand held system has added advantages in future with complete solution going as wireless with almost hands free operations and easy navigability across software application, minimal intervention and even reduction of manpower at centre. Immediate central cloud stage analysis with timely payments mechanism embedded helps in making this system quite robust and better solution over conventional systems. Procurement solutions need to be compact and devoid of complexities with easy manoeuvrability across different units attached to it. The proposed system invites for easy customizability across different collection centres and is not at all vendor dependent. Operators dealing in procurement systems usually come up with the problem of handling and operating complicated applications in conventional systems. Even many rural youngsters wanted to stay away from the job as they find it difficult and burdensome. Hand held milk procurement system altogether makes the process of working hands free and quite easy with quick identification of farmers and cloud analytics.



Today, the farmer payment for milk collection happens in an extremely long drawn process. If direct farmer payment can be done using wireless technology and integrating PMJDY (Pradhan Mantri Jan Dhan Yojana) [16], it can be beneficial to farmers, consumers and dairy sector. Farmer payment mechanism is seamlessly integrated with hand held system where in direct payments via bank binding can be ensured in future. In spite of long lag time of payment this mechanism can bring in more transparency and timely payments resulting in farmer delight.

Already many Dairy companies have deployed IoT hand held computing device solutions to strengthen up their collection units. Dairy companies like HATSUN (Tamil Nadu, Maharashtra and A.P), Thirumala (Tamil Nadu and A.P) etcetera have been continuously scaling up on such solutions and realizing better operational results with improved earnings. Even Dairy farmers in the region are able to fetch better prices for their milk from Dairy companies and are happy to have such Technological solutions deployed.



Figure 5: Pictorial view of IoT hand-held computing device based solution at a dairy Society

Comparative Analysis:

	Personal Computer Based System	IoT hand held Based System
Mode of data entry	<i>Semi-Automated</i>	<i>Fully Automated</i>
Monitoring reliability of quality analysis	<i>Manual</i>	<i>Automatic by trend analysis</i>
Data Reliability	<i>Moderate</i>	<i>High</i>
Data Accuracy	<i>Moderate</i>	<i>High</i>
Data Transfer	<i>Manual</i>	<i>Automatic</i>
Data Analysis	<i>No</i>	<i>Yes</i>
Rate Chart Administration	<i>Local</i>	<i>Centralized</i>
Vendor Dependency	<i>High</i>	<i>Low</i>
Data Maintenance Cost	<i>High</i>	<i>Low</i>

Summary & Recommendations

Overall the combined benefits of hand-held device based system are far more beneficial over current pervasive Personal Computer based systems and entails better utilization and optimum expenditure for investment in several collection & chilling centres. With NDDDB-Dairy Phase-I coming up and several World Bank projects and investment in dairy industry per se requires further strengthening of dairy supply chain with better systems and advanced technology. Imperative lies on the apex bodies to ensure making dairy collection and chilling centres at par with developed dairy countries embedding IoT and cloud solutions.

When at this time the Prime Minister is moving towards technologically advancing country and strengthening rural supply chain, it is high time for apex bodies to incorporate in principle matters and policy framing for dairy Industry to move in a similar direction. With huge expenditure on Microsoft licences we are moving a lot of money outside the country. Our Studies suggests that



even 10% of switch over to Hand held systems can help in saving 24 crores of money. This can be looped back in dairy Industry to make it stronger and let help farmers to fetch better prices.

With a huge surplus in milk production and many private players looming in the country seeing the big opportunity in dairy industry, it is high time to move ahead with solutions which make the industry at par with latest technological solutions. Need of the hour is such miniature cloud based hand held systems where end to end seamless integration and optimum utilization happens with less operational and capital expenditure on collection centres.

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References

1. National Dairy Development Board

(<http://www.nddb.org/about/genesis/significant/facts>)

2. Milk Production in India

(<http://www.nddb.org/information/stats/milkprodindia>)

3. India 75 million dairy farms now make more milk than all of the European union

(<http://qz.com/235085/india-75-million-dairy-farms-now-make-more-milk-than-all-of-the-european-union/>)

4. Innovative procurement practices help dairy sector in India

(<https://nl4worldbank.org/2016/07/06/innovative-procurement-practices-help-dairy-sector-in-india/>)

5. India: Increasing demand challenges the dairy sector

(<http://www.fao.org/docrep/011/i0588e/I0588E05.htm>)

6. The Internet of Things – Cisco

(www.cisco.com/c/en_in/solutions/internet-of-things/overview.html)

7. Stellapps dairy technology solution provider

(<http://www.agricultureinformation.com/postings/stellapps-dairy-technology-solution-provider/>)

8. PC systems Comparison: Laptop vs. Desktop vs. Handheld computers

(http://www.andybrain.com/archive/mb/comparing_computers.htm)

9. The Hindu news for Falling milk procurement prices put dairy farmers in a churn

<http://www.thehindubusinessline.com/economy/agri-business/falling-milk-procurement-prices-put-dairy-farmers-in-a-churn/article8452160.ece>

10. grant-thornton-investing-in-the-internet-of-things-spotlight-on-dairy

<http://www.grantthornton.ie/globalassets/1.-member-firms/ireland/insights/publications/grant-thornton-investing-in-the-internet-of-things-spotlight-on-dairy.pdf>

11. 'Technology Digest' News for 'Internet of things'

[http://www.traigov.in/WriteReadData/Publication/Document/201508240407369554431July,%202015%20\(1\).pdf](http://www.traigov.in/WriteReadData/Publication/Document/201508240407369554431July,%202015%20(1).pdf)

12. Village Based Milk Procurement Systems Under NDP

<http://www.nddb.org/services/cooperative/villagendp>

13. Strengthening infrastructure for quality & clean milk production

http://pibmumbai.gov.in/English/PDF/E0000_SH29.PDF

14. Model project on Automated Milk Collection Centres

https://www.nabard.org/pdf/Model_project_on_Automated_Milk_Collection_Centers.pdf

15. Government of India and World Bank sign US\$ 352 Million Agreement for National Dairy

Support project

<http://www.worldbank.org/en/news/press-release/2012/04/13/project-signing-government-of-india-and-world-bank-sign-us-352-million-agreement-for-national-dairy-support-project>

16. News for All you wanted to know about: Jan Dhan Yojana

<http://www.thehindubusinessline.com/opinion/all-you-wanted-to-know-about/article6370254.ece>



17. Windows Genuine Licence Cost

https://www.microsoftstore.com/store?keywords=windows+licencence&SiteID=msin&Locale=en_GB&Action=DisplayProductSearchResultsPage&result=

18. Milk Procurement

<http://dairy-technology.blogspot.in/2014/11/milk-procurement.html>

19. Mobile_Payments_how_digital_finance_is_transforming_agriculture

[http://www.ruralfinanceandinvestment.org/sites/default/files/Mobile Payments how digital finance is transforming agriculture.pdf](http://www.ruralfinanceandinvestment.org/sites/default/files/Mobile_Payments_how_digital_finance_is_transforming_agriculture.pdf)



Authors' Profile

Mr. Praveen Nale – Co-Founder, Stellapps Technologies Private Limited

Has more than 20 years of experience including solution design, pre-sales, consulting, R&D across top-notch companies like Nortel, Airtel, Thompson, Wipro etcetera. Have a rare combination of hands-on exposure to both hardware and software. He is an M.Tech in Computer Science from IIT- Madras. Previously Chief Architect for enterprise VAS & Hardware design has also served as member of “Centre of Excellence” for Wipro Technologies. From 2011 onwards, he has been instrumental as an entrepreneur of Stellapps Technologies making Dairy Industry technology embedded focused on developing & deploying Smart systems across Dairy ecology.

Mr. Ramakrishna Adukuri – Co-Founder, Stellapps Technologies Private Limited

Has more than 20 years of industry experience including solution design for companies like Cisco, Avaya, Ericsson, Norton, Wipro etcetera. He is an M.Tech in Computer Science & Information Technology from IIT Kharagpur. Previously served as Chief Architect, Unified Communication & Cloud Expert and even as member of “Centre of Excellence” fort Wipro Technologies. In the last few years he has been an entrepreneur focused on developing M2M, Smart Systems and Internet of Things based end-to-end solutions specific to industry segments specific emerging economies like India. His company, Stellapps Technologies, is making significant inroads in to applying these technologies in to Dairy and Agriculture sectors.

Mr. Venkatesh Seshasayee– Co-Founder, Stellapps Technologies Private Limited

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Mr. Peeyush Pallava: Business Development Manager, Stellapps Technologies Private Limited

He is an IIMA alumnus with an experience of 2 years in business development. He has keen interest in business modelling and strategy. Being part of a start-up, he has varied exposure in Product development, Marketing, Operations, Testing & Support. Instrumental in developing core business and major clients' for Stellapps Technologies has a vibe for meticulously eyeing operations.



Company Profile

Stellapps Technologies (p) Ltd., Bangalore is an IIT-Madras incubated start-up founded by a group of IIT-ians and technologists with rich industry experience. Stellapps' innovative applications leverage Inter of Things (IoT) & Big Data to improve Agri-Dairy supply chain, including milk production, milk procurement, cold chain, animal insurance and farmer payments. The SmartMoo™ brand of Stellapps is capable of supporting hundreds of millions of liters of across millions of milch animals spanning millions of farmers. Stellapps SmartMoo™ suite of applications analyse & crunch the received data before disseminating the analytics & data science outcome to various stakeholders over low-end and smart mobile devices. We have products as in SmartFarms™, smartAMCU™, and ConTrak™, AgRupay™ and MooKare™ which aim to connect entire dairy supply chain from milk procurement to milk cold chain logistics level.

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