CREW: A Cloud based Revenue model for Rural Entrepreneurial Women in India

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Article Info	ABSTRACT
	The new paradigm Cloud Computing is the next logical step in distributed systems, which supports the sharing and coordinated use of resources, independent of its location and type. Cloud computing allows you to unite pools of servers, storage systems and networks into a single enormous virtual resource pool so that you can use it for single resource-intensive task. This technology has the potential to address the unmet needs of Indian villagers from education to market access. In India, Self Help Groups (SHGs) represents a unique group of poor women who have volunteered to organize themselves into a group for eradication of poverty of its members. The main objective of this research paper is to exploit the Cloud technology as a profit making model for the SHGs of the country. This paper explores and discusses in detail the need for the proposed model, its benefits, its various components, their responsibilities, the trading process, requirements for feasibility and other initiatives that work towards the economic growth of entrepreneurial rural women in India. The proposed model CREW will certainly provide a strong sustainable economical grip to transform the economically disadvantaged women to be Self – Reliant.

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1. INTRODUCTION

The recent technological advancement in high performance computing and resource sharing across the globe, has revolutionized the computing model. The trend from using super computer and mainframes with high computing power has now shifted to the cluster of computers with low computing power which leads to the concept of Cloud computing [1]. Cloud computing alleviates the need for procuring own resources thereby reducing the cost of investment on the computing resources. The required Information and Communication Technology (ICT) infrastructure can be provisioned on demand in a pay per use model [2].
The rural kiosk was the first step to Information Technology by the rural women through the Self Help Groups (SHG) [3]. Rural people use it for E-governance, Agricultural information, Internet browsing and in few places children are educated in using computer software. Moreover since the literacy rate is very low in many areas, not much of CPU time and computer's memory are utilized in these kiosks or computers [4]. This results in limited revenue generation.

This scenario led to the need for developing a model that would fetch additional revenue to the women self help groups. Recently many commercial cloud models are being developed to utilize the computing power [2]. This research paper focuses on developing, a revenue generating cloud model, CREW for the Women SHG of the society which would help in women empowerment.

2. REVIEW OF LITERATURE
2.1 Cloud Computing
Cloud Computing has gained popularity recently and has led to the concept of "Public Cloud" were resources are pooled virtually and are shared. Cloud services are not limited to Infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS) [2]. The main components of an economic cloud model are resource advertisement, dynamic resource provisioning, Service level Agreements (SLAs), Resource reservation, workload partitioning, Accounting, metering and payment models. In a hybrid cloud scenario, resources are virtually pooled from external heterogeneous sources. These are further provisioned and added to the pool of worker nodes. For example, a cluster of personal computers (PCs) can be provisioned for cloud services, when they are not busy. This involves putting into work additional cloud middleware and software.

2.2 e-Governance
Global shift towards increased deployment of ICT by governments emerged in the nineties, with the advent of the World Wide Web which paved clearer avenues for Government to Customer interactions. E-governance originated in India during the seventies with a focus on in- house government applications in the areas of defense, economic monitoring, planning and the deployment of ICT to manage data intensive functions related to elections, census, tax administration etc. The efforts of the National Informatics Center (NIC) to connect all the district headquarters during the eighties was a turning point. From the early nineties, e-governance has seen the use of IT for wider applications with policy emphasis on reaching out to rural areas and taking in greater inputs from NGOs and private sector as well [5].

2.2 Self Help Groups [SHG]
Economic independence is the first step towards women's empowerment and empowerment leads to emancipation. This was the aim behind promoting women's self-help groups in India. Generally each SHG may consist of 10 to 20 persons [6]. They generate good revenue through micro enterprise like tailoring, fishery, pottery, basket weaving etc. Further managing E-governance operations in rural areas is also another task taken by the SHGs. The successful rural web kiosk projects in India are e-seva [7], Drishtee [8], IT for Change[9] and N-logue [10]. The e-seva project in west Godavari is run exclusively by women SHG and it is the first of its kind [7]. Women are trained with the necessary skill set supported by non-governmental organizations (NGOs) initiated by the Government. The SHG women receive hands on training on how to use the software in the kiosks and to collect bills. They are also trained on ownership and management. SHG strategy has not just helped in empowering the impoverished but also enables re-channelizing individual strengths into collective good. Rural kiosks, was the first step to ICT by SHG. To our dismay, research shows that the number of daily kiosk customers is low, with nearly a third to a half of the kiosks reporting less than five customers per day [4]. Hence average monthly income at kiosks remains low, with both mean and median at approximately Rs. 2000 per month, and this is below the target break-even income desired by either company (between Rs. 3000 and 5000, depending on terms of the loan, cost of connectivity, and the initial capital expenditure on hardware) [4]. This data is consistent with that observed in other studies [10, 11]. This clearly indicates that there remains a huge pool of resources that are unutilized and can be employed for other purposes.

3. CREW: THE PROPOSED MODEL
This need based model was developed to transform the living standards of the Women SHGs in the rural areas. It improves resource utilization and generates profit for both the cloud service provider and the consumer. Study shows that 40% of the rural women in the SHGs are illiterates [12]. Hence it may be difficult for them to directly interact with the Cloud Resource Consumers and trade their services. This model introduces the concept of Business Development Manager (BDM) to facilitate the SHGs (Resource Owner). The BDM acts as a liaison between the Resource owner and the resource consumer to benefit the rural SHGs. Figure 1 explains the proposed model.

The following are the four main components of the proposed model. Apart from this appropriate Cloud Software and middleware run in all these components, which are beyond the scope of this paper.
1. Self Help Groups -Resource Owner [RO]
2. Business Development Manager [BDM]
3. Cloud Market Directory[CMD]
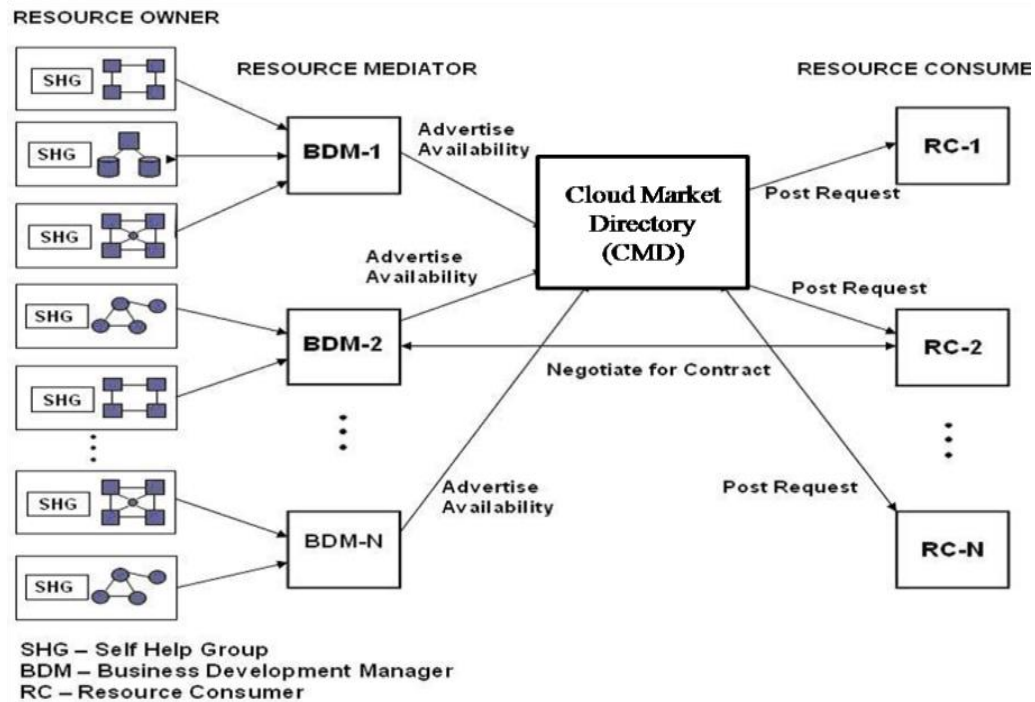4. Resource Consumer [RC]

Figure 1. CREW - The Proposed Model

3.1 Self Help Groups [SHGs] – Resource Owners [RO]

In the proposed CREW model, SHGs are the Resource owners. The model suggests that the SHGs can utilize their existing Kiosk / Computer. Additional Cloud middleware, necessary Software, UPS and other requirements will be installed by the BDMs. The SHGs have to contact the nearest BDM and give their concurrence for this project. The BDMs will look into the Infrastructure requirements. This additional revenue generated will be shared among the SHGs by the BDMs. A single BDM can cater to 10-15 SHGs.

3.2 Business Development Manager [BDM]

The BDM acts as a RO agent who mediates between the RO and the RC. He negotiates with the RC and sells access to resources. He aims to maximize the resource utility and profit for the resource owner (i.e) generate as much as revenue as possible. There may be any number of BDMs as the need may be. The BDM has two components. One is the BDM server and the other is a human BDM. BDM can be a NGO with relevant knowledge in this field. Figure 2 explains the BDM activities.
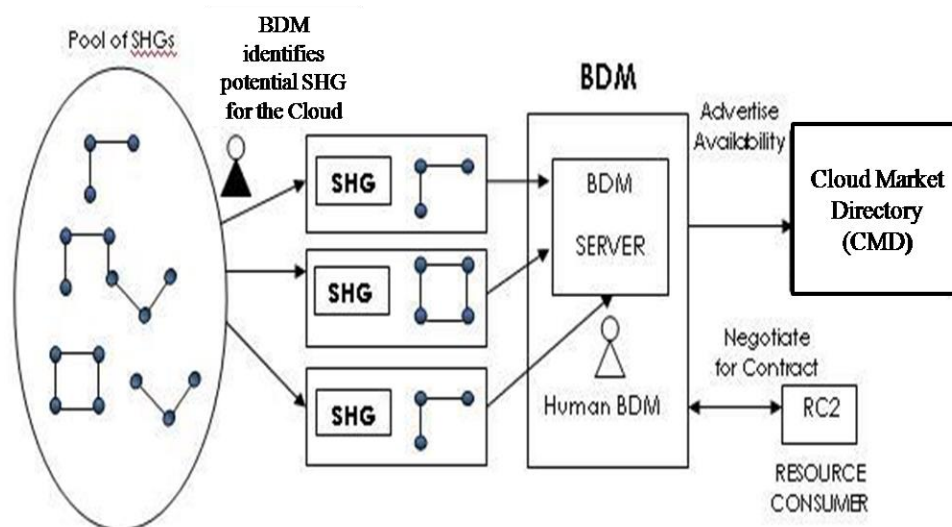

Figure 2. CREW – BDM Activities

The human BDM is the key coordinator and the following are his activities

- Resource Advertisement – Adopting a profitable marketing Strategy.
- Consumer Discovery- Finds from the CMD a suitable RC to expand business.
- Trading with the RC – Determining Pricing Policies [13] (These define the prices that BDMs or ROs would like to charge consumers), Business Negotiations (Tender/Contract model is widely used for service negotiation [14]. This model is recommended for CREW), Acquire Contract, billing and payment (Use and Pay model can be adapted and payment can be made by using digital currency mechanisms [15]).
- Co-ordinate with the RO on task start, execution and successful completion.
- Business outsourcing - He can also consult and have tie ups with other BDMs to take up larger tasks or manage if there is a breakdown.
- Initiates in building a Cloud framework among the SHG who has a PC or Kiosk or initiates in procurement of PCs for the interested group.
- Installation of Cloud user friendly software and middleware in PCs or Kiosks.
- Training the SHG on the basic Cloud operations(initiate a PC for Cloud)
- Fair distribution of the revenue earned, with the SHGs(RO)

The BDM Server is a resource monitor and the following are its activities

- Automated Resource advertisement and updating is done by the BDM server by tracking the availability of the resource owners.
- Automated Consumer Discovery- It finds a suitable RC from the CMD.
- Trading with the RC – Accounting, e-billing and e-payment.
- Business Agents- They track the status of the other BDMs at times when Business Outsourcing is required.
- The overall health and availability of Resources in the control of that BDM are monitored and the RO table in the CMD is updated accordingly

3.3 The Cloud Market Directory (CMD)

To enable the Cloud economy, a market-like Cloud environment including an infrastructure that supports the publication of services and their discovery is needed [15]. Hence CREW proposes a CMD Server which maintains centralized resource repository of the RCs, BDMs and their trading. Figure 3 explains this. The following are the services of the CMD.

- BDMs advertise on the CMD on behalf of the ROs.
- RCs post their requirements on the CMD.
- RCs look up the CMD for finding the appropriate trading partner who can meet their requirement and solve their problems.
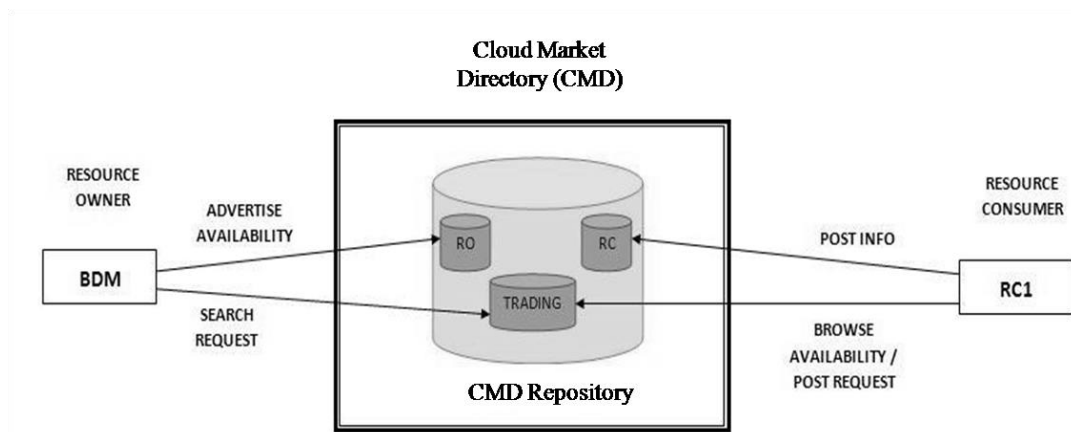- BDMs look the CMD for a profitable trading partner.

Figure 3. CREW – CMD Activities

The following are the tables that are maintained in the CMD

1. **Resource owner Table** – This contains the information about the resource owners such as BDM, location, Configuration, Availability, Pricing policies etc. The advertisements made by the BDMs are recorded in this table. Every RO in the Cloud has a unique entry in this table. Detailed document on the Terms and Conditions specifying the pricing, payment and privacy policies are available in this table.
2. **Resource Consumer Table** – This contains the information about the resource consumers such as location, Required Configuration, Approximate time and Duration of the resource requirement, Nature of resource required, pricing policies etc. The request requirements posted by the RCs are recorded in this table. Every RC in the Cloud has a unique entry in this table. Detailed document on the policies are available in this table.
3. **Trading Table** – This is a transaction table to record the transactions between the RO and the RC. This table keeps track of all the resource utilization which helps in accounting, billing etc.

3.4 Resource Consumer (RC)

They are the ones who have computation intensive task, need to be shared and completed within a time frame and are seeking commercial or voluntary ROs. RCs may be semi-automated or fully automated. The basic functionalities of the RC are:

❖ RCs Post there requirements on the CMD.
❖ Resource Discovery - By interacting with the CMD, identifies the list of ROs, and the BDMs mediating the ROs.
❖ Resource Selection – This done dynamically at runtime during requirement. RCs look up the CMD for finding the appropriate trading partner [BDM] who can meet their requirement and trade with the BDM.
❖ They can trade with any number of BDMs with suitable trading policies.
❖ Electronic Payment for the resource utilization is made by the RC to the BDM according to the accepted pricing policy during contract.

4. CONCLUSION

Literacy is not about basic skills of reading and writing. It is about providing individuals with the capabilities for understanding their lives, social environment, equipping them with problem solving skill and exposing them to technical advancements. CREW is a model that exploits the Cloud technology for the additional revenue generation of the Women Self Help Group of the Country. Whether it is city slums or interior villages in rural side, the concept of self-help groups has made a big difference to the life of several women. We hope that implementation of this model will not only change their physical well being, but will certainly make women more confident, assertive and aware of their rights. Despite its growing population, the success of India's IT industry and the government's stated intent of wiring up villages, India lags in bandwidth necessary for information access on the internet and uninterrupted power supply which we hope would be overcome soon to make this model a reality.

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