Proposal for Establishment of an Innovation Centre for Developing "Smart Banking" Solutions

1. Introduction

Emergence of Pervasive Computing and modern communication technology has lead to creation of Smart Environments. These environments expected to aid the people to lead quality life. Smart environments understand the given situation and can respond in an appropriate way. These environments may be made as personal like "Smart Home" or public like "Smart Hospital", "Smart Bank", etc. Further, it is believed that computing in such smart environments will move from traditional computers to a platform free of embedded computing present in an smart devices. This proposal is aimed at developing a centre for for carrying out innovation in smart banking environment. Smart Banking can be achieved by carrying out research in various fields like "Pervasive Computing", "Service Oriented Architecture", "Software Agents", "Context-aware Computing", etc,.

2. Background

A smart banking environment is a context sensitive system based on ubiquitous computing, in which the banking environment interacts with its inhabitants through embedded dedicated devices. This environment offers ample benefits to the stake holders of the banking system in terms of quality of service, cost and time. The design and construction of a smart banking environment requires the collaboration among several areas, such as

- Intelligent man-machine interfaces,

- Pervasive communications,

- Ambient intelligence,

- Scalable systems and

- Mobile computing etc,.

Smart Banking Environment has several facets. This environment can be modeled as virtual or real. Firstly, taking the virtual smart banking environment which offers the promise that people will be able to interact with their digital support tools at any time and any place. Such pervasive access to digital tools means that users should be able to work with these tools in

the full range of their normal banking activities. So, for example, they will be able to access them in the many and diverse locations of daily activity: at home, in their car, on the bus or train, in the supermarket, and at work. They should also have access to these digital artifacts in less common situations, such as at the hotel on their holiday or at the convention centre on a business trip. Secondly, considering the real smart banking environment this offers the smartness in the real banking environment like branch, ATM etc. with the help of pervasive devices of the bank and/or customers.

In addition to being accessible anywhere, the future smart banking environment must be *context-aware*. This includes awareness of such diverse elements as the user's location, their activity and the social context defined by the presence of other people. The way that a digital artifact should interact with the user depends upon that context. These advances in mobile communications, location and sensing technologies and data processing are boosting the deployment of context-aware personalized services and the creation of smart environments. Nevertheless, they pose a serious risk on user privacy rights, since they demand, collect and process a large amount of personal data. To address this, middleware architectures are conceived on the basis of privacy legislation is proposed, aiming at providing privacy by technical means. The main concept of these architectures is the development of a unit of trust, which acts as a privacy mediator between users, networks, service providers, monitoring devices and authorities.

3. The Proposal

This proposal focuses on the modeling of a Reference Architecture for developing Smart Banking environment and associated applications. This proposal considers three main processes in the Software Architecture of these applications: *a*) perception, *b*) reasoning and *c*) acting. Following activities are planned to carry out:

- A computational model to describe the smart banking environment and also the interactions between the environment and its devices.

- Reference Architecture(s) to support the above computational model.

- A computational model to facilitate the representation of the physical environment as a computational environment

- Techniques and applications for ubiquitous computing and communications

- Adaptable environments and devices

- Intelligent interfaces between humans, devices and the environment

- Seamless interaction between any pair of devices

Typical components of a smart environment are widely divided in four layers: *a*) physical, *b*) communication, *c*) information and *d*) decision. This approach joins hardware with software agents, so very heterogeneous elements appear in the same component model such as a *decision maker* and *sensors* or *actuators*. All these components must collaborate to achieve the goals of automatism that a smart banking environment is required.

4. Methodology and Work plan

It is proposed to follow a typical engineering methodology

- Studying of current smart environment solutions and real time banking environment

- Proposal and developing of a better solution base din the above study.

- Measurement, analysis and validation of the solution proposed

so the work will be divided in three phases:

- Analysis state of art. Researching must start from reading current work and test some of the solution proposed by the researching community to find issues and lacks.

- Reference Architecture for Smart Banking Environment Proposal.

- Develop of a Smart Banking Environment Solution(S). In order to test the architecture proposal, a smart environment application(s) will be developed and deployed.

5. Action Plan Phase I

Details of year-wise work proposed to be carried out in the thrust areas

Year – 1 (2018-2019) (Phase I)

1. Workshop to propagate knowledge in Pervasive Computing and its implications in Banking Domain and to deliberate the research opportunities in Pervasive Computing.

2. Accelerating research in the areas of

   a. Pervasive Computing: Vision and Challenges

   b. Trustworthy and personalized computing on public kiosks

   c. Sensors and Opportunistic Sensing

   d. RFID & Its Applications

3. Guest lectures to be delivered by Academic and/or Industry experts from the field of Pervasive Computing

4. Introduction of Soft core paper "Pervasive Computing for Banks"

5. Preparation and Submission of 1st year activity report

Year – 2 (2019-2020) (Phase I)

1. Seminar to propagate knowledge in Context-Aware Computing and its implications in Banking Domain and to deliberate the research opportunities in it.

2. Accelerating research in the areas of

   a. Context-based Information Retrieval

   b. Location-based Services

   c. Mixed-Media Environments

   d. Tagging Systems, other Semantic Web Applications

   e. Knowledge Management and Knowledge Media Creation

   f. Collaborative Virtual Environments

3. Guest lectures to be delivered by Academic and/or Industry experts from the field of Context-Aware Computing.

4. Workshop in association with Banks and Software Industries.

5. Preparation and Submission of 2nd year activity report.

Phase II

Year – 3 (2020-2021) (Phase II)

1. Workshop / Seminar to propagate knowledge in Middleware Technologies for Pervasive Computing and its implications in Banking Domain and to deliberate the research opportunities in this area.

2. Accelerating research in the areas of

    a. Middleware for Pervasive Computing: Communication Perspective

    b. Middleware for Pervasive Computing: Data Perspective

    c. Middleware for Pervasive Computing: Security Perspective

3. Guest lectures to be delivered by Academic and/or Industry experts from the field of Middleware for pervasive computing.

4. Introduction of Soft core paper "Middleware Technologies for Banks"

5. Preparation and Submission of 3rd year activity report

Year – 4 (2021-2022) (Phase II)

1. Workshop to propagate knowledge in Intelligent interfaces between humans, devices and the environment and its implications in Banking Domain and to deliberate the research opportunities in this topic.

2. Accelerating research in the areas of

    a. hypertext, hypermedia and hyperlinks

    b. speech recognition, speech synthesis, natural language processing, non-speech audio input

    c. mouse gestures and handwriting recognition

    d. CSCW: Computer Supported Collaborative (or Cooperative) Work, collaborative software

    e. Ubiquitous computing

3. Guest lectures to be delivered by Academic and/or Industry experts from the field of Intelligent Human Computer Interface

4. Preparation and Submission of 4th year activity report.

Phase III

Year – 5 (2022-2023) (Phase III)

1. Workshop / Seminar to propagate knowledge in Software Architecture and its implications in Banking Domain and to deliberate the research opportunities in the topic.

2. Accelerating research in the areas of

    a. Service Oriented Architecture

    b. Reference Models

    c. Reference Architectures

    d. Reference Architecture for Smart Banking

3. Guest lectures to be delivered by Academic and/or Industry experts from the field of Smart Banking

4. Introduction of Soft core paper "Smart Banking"

5. Preparation and Submission of 5th year activity report and Consolidated 5 Year Report with a request for sanctioning assistance for next 5 Years.

In this way the programme can progress to Phase – II of the Proposed Scheme and make the Department of Banking Technology as a Centre for Advanced Studies in "Smart Banking".

5. Resources (Human & Financials)

Smart banking is the next paradigm in the banking domain which facilitates the customer to do safe and smart banking operations. General software architecture is very necessary to develop smart banking environment applications, which involves lots of issues difficult to avoid such as distributed applications, heterogeneous systems, protocols, devices, languages or context-aware applications. This proposal is aiming to achieve "Smart Banking".

Items for which the Financial Support for the the Proposed Programme

Sl. No.	Items	Phase I	Phase II	Phase III
	Non-Recurring			
1	**Equipments**			
	a. Servers	16.00		
	b. PC (20 Nos.)	5.00		
	c. Automated Teller Machine	10.00		
	d. Pervasive Devices (5 Nos.)	5.00		
	e. Printers & Xerox	5.00		
	f. Scanner ^ Storage	1.00		
	g. Furniture+ Networking	10.00		
Total Non Recurring				**52.00**
	Recurring			
1	**Salary/Fellowship for Project Fellows**	20.00	20.00	20.00
2	**Travels/ Field Facilities/Field Trips** for Faculty Members with in India and abroad	25.00	15.00	5.00
3	**Visiting Fellows / Technical assistance** (Foreign Consultants)	10.00	15.00	20.00
4	**Seminars/Workshops**(for organization) on thrust area	7.00	8.00	10.00
5	**Hiring the services** of Technical/Industrial/Secretarial assistant as relevant to the programme(for the programme duration only)	5.00	5.00	5.00
6	**Advisory Committee meeting** (TA/DA nominees in the Committee)	3.00	4.00	5.00
7	**Books and Journals**	5.00	5.00	5.00
8	**Project Specific Licensed Software's and Databases**	30.00	30.00	30.00
Total Recurring				**Rs. 262.00**
	Building Space Requirement (4200 sq ft)			**Rs200.00**
Total				Rs. 2,62,00,000/- + 97,00,000/- +2,00,00,000 = **5,59,00,000/-**