CHAPTER 2

REVIEW OF LITERATURE

2.1 INTRODUCTION

In this Chapter, relevant articles in service selection for pervasive, health care, social network and cloud environments are reviewed and are presented in detail.

2.2 SERVICE SELECTION IN PERVERSIVE ENVIRONMENT

In recent years, many researchers have focused on proposing feasible mechanisms to select appropriate services from a group of service providers. Some of them have proposed various service selection schemes using artificial neural network (Haibin Cai et al., 2009), fuzzy based UDDI with QoS support (Hei-Chia Wang et al., 2007), simulated annealing based genetic algorithm (Kim M.J., et al., 2006).

Feng Zhu et al., 2007 proposed a method to solve the problem of exposing users and service provider’s identity. The progressive and probabilistic exposure method allowed the users and the service providers to expose partial information and avoided further disclosure of the information, when there was any mismatch. The process converged faster and false positive overhead decreased quickly. The calculation of the probability of the user and service provider was
based on heuristic information. One of the major drawbacks was that the mobile users used the recent information but the immobile users used the information from the cache for service discovery. The progressive and probabilistic exposure method did not support service discovery by attributes. In addition to the network problems that affect the progressive and probabilistic approach, most of the interactions were wasted due to false positives, thereby reducing the performance of the model if the number of service providers providing similar service exceeds 500. Sheikh I. Ahamed et al, 2008 proposed a hybrid model that allowed both secure and non-secure discovery of services. The hybrid model allowed service discovery based on sharing the mutual trust. Trust was built based on the prior information of the service provider. If there was no prior information a risk model was introduced that analyzed the risk of sharing the service based on the heuristic information and necessary action was taken. The performance evaluation was done based on the battery power alone whereas the other factors such as availability, and mobility were not considered. Sheikh I. Ahamed et al, 2009 presented SMARKS, a middleware that resolved the communication and security issues. The model incorporated device validation, resource discovery and a privacy module.

Kim M.J. et al, 2006 proposed an architecture that exploited stable and resourceful nodes termed as volunteers for directory services. The heterogeneity of the service provider was considered in terms of mobility and capability. Resource value and a mobility degree had to be maintained to select the volunteer service provider without any leader. The volunteer nodes played the major role of discovering the services but the factors such as trust and load balancing were not considered. Anandha Gopalan et al, 2010 proposed an unified, overlay – based service architecture that supported large-scale service and application deployment in pervasive environment. The modes of data delivery from the service provider
were Polling, Continuous, Event Driven which had its own disadvantages such as flooding and delay. Haibin Cai *et al.*, 2009 proposed an ANN based evaluation standard for the service quality of the service provider. An improved Back Propagation algorithm with three term method (TTMBP) was provided that satisfied the requirements of time issue in real time system by considering the learning rate, momentum factor and proportional factor. The TTMBP methodology avoided the blindness and randomicity in service selection.

Gao Zhi-peng *et al.*, 2009 proposed QoE/QoS driven composite Web services evaluation model. The best suitable web service was selected using simulated annealing-based (SA-based) genetic algorithm (GA). The combination of SA-based GA was to avoid the problem of local optima. The quality of service parameters considered by the selection model was service cost, execution time, availability and reliability. The QoE indicator for the service composition helped the system to learn from user’s experiences. Hei-Chia Wang *et al.*, 2007 proposed the web service selection based on the combination of two algorithms namely Genetic algorithm and fuzzy logic. Genetic Algorithm was used to learn user preferences and fuzzy logic was used to make decisions. The authors considered the nonfunctional quality of service parameters along with the functional information that provided the suitable service to the user. The membership function and fuzzy rules were initially predefined based on the historic information, but was insufficient. To overcome the insufficiency, the member function and the fuzzy rules were refined based on learning. The Quality of service parameters such as availability, reliability, bandwidth, response time, and execution were considered.

Liu Y. *et al.*, 2004 proposed an extensible QoS model that was open, fair and dynamic for service requesters and service providers. The dynamic and fair
computation of QoS values of web services were achieved through a secure active users’ feedback and active monitoring. The feedback provided by the user was used to determine the success of the extensible model. The extensible QoS model ensured that every user provide the feedback in a straight forward manner for proper functioning. Taher L. et al, 2005 proposed a QoS Matchmaking algorithm for dynamic web service selection. It was comprised of two models: data model and computational model. The data model collected the factors influencing the service selection and the computational model performed the process of finding the best possible match by using the Euclidean distance. The credentials were also validated using the validation manager. The QoS factors had been derived with the assumption that the network conditions were static which may not be the real time scenario.

Galizia et al, 2007 attempted to enhance the capability-driven selection in semantic web service frameworks using trust based selection criteria. Galizia et al, 2007 presented a Web Services Trust Ontology which enabled the users to describe semantically their trust requirements and guarantees. Whenever trust policies of the participants match a trusted interaction could occur. The emphasis was on trust and not on any other QoS parameters. Trust need not be the only QoS factor that required to be considered; there can also be other factors such as cost, availability, reliability etc that required to be considered for service selection. Baopeng Zhang et al, 2007 proposed a policy driven service composition method for adaptation in pervasive environment that enhanced the capability of application adaptation. The service discovery policy action integrated the situation of user, application, environment and resource. The proposed physical space model could support the location-aware service discovery and explicit range query that improved the efficiency of the query.
Baopeng Zhang et al, 2007 explained an adaptation policy evaluation model that attempted to maximize the quality of satisfaction of users and environments.

Yao Wang et al, 2007 proposed a typology that classified the trust and reputation systems from three aspects, centralized vs. decentralized, persons/agents vs. resources, global vs. personalized. Those aspects were important to clarify the difference between various trust and reputation systems. The typology pointed out the potential requirement for trust and reputation in web services. Swaroop et al, 2007 proposed a dynamic service composition model that employed the service-oriented middleware platform called Pervasive Information Communities Organization (PICO). The proposed service composition mechanism modeled services as directed attributed graphs and maintained a repository of service graphs. The hierarchical overlay structure exploited the resource unevenness that resulted in the capability of providing essential service-related support to resource-poor devices, which supported in efficient service discovery. LATCH protocol was proposed to implement the hierarchical service overlay structure. User mobility and heterogeneity of the resources in terms of capability were considered as quality of service parameters. The main limitation of the model was that the model required the device capabilities during the design time. Dabrowski et al, 2007 presented a set of experimental methods that analyzed the robustness in discovery systems under increasing failure intensity. Effectiveness, responsiveness, and efficiency were considered as the qualitative measures that evaluated the service discovery systems.

Sonia Ben Maktar et al, 2008 presented a service discovery model, EASY to support efficient, semantic, context- and QoS-aware service discovery. EASY had EASY-L, a language for semantic specification of functional and non-functional service properties and EASY-M, a corresponding set of conformance
relations. To assess conformance between service capabilities EASY provided an efficient encoding technique. It also had an efficient organization of service repositories that enabled service advertising and discovery. Price, availability, latency and type of network were considered as the parameters for service discovery. Siouta S. et al, 2009 proposed structured P2P overlay network infrastructure designed for Web Services Discovery. The major advantage of structured P2P overlay network infrastructure design was to overcome performance bottlenecks and fault tolerance. The Web Service discovery structure over a P2P network required the determination of the node that stored the Web Service item which satisfied the range criterion. The authors proposed NIPPERS, a protocol that solved the problem in a decentralized manner. This works perfectly for small-scale distributed computing platforms.

Reto Hermann et al, 2001 developed the DEAPspace project that supported the proximity-based collective distributed applications. Push-model-based approach for fast and resource efficient service discovery, and encoding and match-making of compact service descriptions were discussed. DEAPspace project was not quality of service aware. Noura Limam et al, 2006 proposed open service discovery architecture (OSDA), a middleware for inter-domain discovery to be achieved independently of domain-specific service discovery technologies. The middleware had addressed the services that span over both heterogenous and independently administrated domains. It was an open, scalable and fault-tolerant middleware for cross-domain discovery. The well-defined standard interfaces such as EJBs, Web Service and JXTA, communication protocols such as SOAP and JXTA end-point communication pipes and unified data representation such as XML for messages and service descriptions were used to bridge the differences among heterogeneous local discovery systems to provide cross-domain service discovery.
Marco et al, 2008 presented Web service discovery query by example (WSQBE), a novel search method for Web services aimed at both easing query specification and assisted discoverers by returning a short and accurate list of candidate services. WSQBE discovery process was based on an automatic search space reduction mechanism. The main limitation of WSQBE was that it assumed that a corpus of previously classified services was available. This generated the inability for handling dynamic creation of categories without re-building the classifier. Christos Doulkeridis et al, 2008 proposed CASD, a context-aware service directory. CASD was a context-based index for services on top of any traditional service directory, and designed algorithms for construction, search, update and merge of such directories. The dynamic nature of the mobile environment imposed the requirement for directory-based discovery. Context played an eminent role with mobility, as a filtering mechanism that enhanced service discovery through the selection of the most appropriate service.

Jaehoon Jung et al, 2008 proposed Distributed Hash Table based service discovery protocol for wireless sensor networks. The protocol constructed the topology-aware overlay networks in ubiquitous environments. The protocol did not rely on centralized server and multicasting. Swaroop Kalasapur et al, 2005 had proposed a methodology that dynamically composed the services by effectively utilizing the collective capabilities of resources available to deliver multimedia. The “discover + match + coordinate “schemes would not be effective in dynamically changing environments, due to various uncertainties involved. Swaroop Kalasapur et al, 2005 presented a novel composition scheme; called Seamless Service Composition (SeSCo), which operated on automatically configurable resource hierarchies for discovery and composition. SeSCo attempted to weave necessary services by utilizing available individual services seamlessly. The main research challenges sorted out by the authors were Locality of services,
Quality of composition, Semantics and Mobility of users and resources. The hierarchical service overlay ensured that the resource poor devices collaborate with a device with higher resource availability for service related operations such as discovery and composition, through the Latch process. The dynamisms inherent to pervasive computing arena, such as user and resource mobility, resource restrictions such as limited battery power, etc., had been handled effectively with the hierarchical service overlay. Swaroop Kalasapur et al, 2005b proposed a novel approach to support adaptive services for multimedia delivery in heterogeneous wireless networks. The service adaptation and composition mechanism exploited the middleware tools developed for pervasive information communities’ organization of software agents.

Dipanjan Chakraborty et al, 2001 proposed the concept of a distributed broker, Anamika that could be executed in any system. The broker coordinated the discovery, integration and execution of different services resulting to the composition of various services. The distributed broker worked on a distributed peer to peer caching based service discovery. Dipanjan Chakraborty et al, 2003 proposed novel design architecture of a broker-based distributed service composition protocol for pervasive environments. The protocol was decentralized and efficiently utilized the spatial locality of the services. Each composite request was independently assigned a broker. The Broker Arbitration mechanism used a controlled broadcast-based scheme to collect information from nearby nodes. Broker Selection was based on a utility value that took into account services present in that node, computation and energy resources and service topology of the surrounding vicinity. The broker selected the resources/ services and then performed service composition in a distributed manner. The authors used a checkpoint-based source monitored fault tolerance mechanism to detect execution-level faults.
Cheng-Liang Lin et al, 2009 proposed an adaptive and intelligent route discovery on-demand approach for service composition. The route discovery was modeled as an adaptive and intelligent path discovery. Since service composition along a network was like a path in a multicast tree, path discovery could be regarded as route composition. Hence, a route-composition was proposed to combine existing services (paths) into candidate complex services (paths) called on-demand route compositions. The proposed route setup mechanism had the following characteristics such as on demand route setup to avoid periodical multicast overhead for member discovery, a directed service graph that represented a transparent route-composition. Candidate routes were found adaptively and intelligently and the best route among candidate routes was determined by the max-flow and min-cut algorithm. The route setup and discovery required low communication overhead in portable computing and wireless environments. The route discovery approach eliminated the periodical multicast control overhead of a multicast source member discovery.

Sonia Ben Mokhtar et al, 2007 proposed a COnversation-based Service Composition in PervAsive Computing Environments with QoS Support (COCOA). The objective achieved within these environments was to assist users in realizing tasks/services that integrated dynamically the functionalities of the networked services according to the current pervasive environment. COCOA provided COCOA-L, an OWL-S based language for the semantic, QoS-aware specification of services and tasks, which further allowed the specification of services and tasks conversations. COCOA provided two mechanisms for the QoS-aware semantic service discovery and for the QoS-aware integration of service conversations towards the realization of the user task’s conversation. COCOA allowed the dynamic realization of user tasks according to the specifics of the pervasive computing environment in terms of available services and by enforcing
valid service consumption. The COCOA vision was based on the strong assumption that service developers and clients describe services with identical terms worldwide, which was the major limitation. This raised the issue of syntactic heterogeneity of service descriptions. The model considered confidentiality, integrity, non-repudiation, atomicity, consistency, isolation, durability, availability, latency, CPU load, memory, bandwidth, battery and price as the QoS factors.

Sun Young Lee et al, 2006 proposed a framework combining the data mining methodology with the ontology engine provisioning middleware system that discovered primitive services and composed dynamic complex services according to the context information. The context information such as location, time, network, computing environment and preference of the users were considered. The data mining engine worked on building new composed services using the service history information. John Buford et al, 2006 proposed a prescriptive set of rules that defined the combination of allowable components for a particular service or application named as Composition Trust Binding. The rules could be used to protect both the service invocation path and the content handling path. The approach allowed a node which created, used or participated in service delivery to enforce its service composition trust requirements by creating an explicit trust binding between the components that might participate in a service composition.

Qun Ni, 2005 proposed Ontology enabled Service Oriented Architecture (OSOA) that combined interoperability provided by Web services and semantic description provided by Ontologies, to assist non-expert users to use devices and even to combine their functionality without explicit goals. The research challenge considered to be solved was interoperability. Jian Yang et al, 2002 proposed the
possibility of tackling the challenges of Service Composition in E-Marketplaces. The authors provided the ability to select and engage other e-services in order to complete higher order business transactions. The main issues were dynamism and volatility. The authors also discussed the facets of e-services that required to be considered than those of workflows or components when it came to integration, e.g., data, functionalities, security, protocols, etc. The various aspects of Service Composition were order of execution, functional and data dependency and alternative service composition. Based on the aspects of service composition the different types of service composition were data oriented, sequential process oriented, parallel process oriented, sequential alternative composition and parallel alternative composition. The main issue was to develop a tool to support the entire cycle of service composition, i.e., discovery, consistency checking, composition, re-use, and extendibility. To provide the requirements of scalable, extensible service composition, the Service Composition Specification Language (SCSL) was introduced that described how the component services were composed and executed in terms of their order, dependency, and alternative execution properties.

Noha Ibrahim et al, 2009 proposed a survey on Service Composition as a sequence of four steps namely the translation, the generation, the evaluation, and the execution. The authors classified the service composition middleware according to pervasive requirements - interoperability, discoverability, adaptability, context awareness, QoS management, security, spontaneous management, and autonomous management. Jianqiang Hu et al, 2009 proposed a Semantic-based Web Service Composition Framework (SWSCF) based on both semantic process recommendation and semantic match making approach, that provided effective integration of distributed, heterogeneous, and autonomous application. Key technologies such as hierarchical activity mechanism for dynamic decomposition of business requirements found a suitable semantic process
template by searching and selecting a service chain to match a semantic activity
template which was used to specify an abstract activity and devising a
heterogeneous message transforming mechanism to eliminate the incompatible
message types during generating data flow of an executable process were
introduced.

Sourish Dasgupta et al, 2009 proposed an event-handling process in the
domain of pervasive computing. The main objective in this framework was to find
the best event target. That could only be guaranteed if the contexts of the end
services producing such event-targets were compatible with the desired event-
target contexts. The service composition process required a source service whose
context is compatible with that of the event to be handled. Thus, a Context-Aware
Ontology Framework for Events and Services, called CAOFES, which worked for
the semantic formalization of the contextual effects of environmental dynamics
that could be brought about by services and events were defined. Three different
compatibilities such as service-to-service compatibility, service-to-event
compatibility, and service-to-event target compatibility were also defined. The
notion of those compatibilities form the essential basis for logically integrating
contexts of services participating in a composition process into event-specific
contextual boundaries called a Situation Boundary (SB). The performance of
compatibility computation of the proposed SB model based on randomly
generated service network and contextual information was appreciable. This
methodology also considered location and time.

Jinchun Xia et al, 2007 provided a framework for building a fault-
resilient service-oriented pervasive computing system. The framework included a
virtual sensor framework and a high performance service composition solution
based on WS-Pro, a probe-based performance-driven service composition
architecture and an abstract service composition template (ASCT) approach. The concept of virtual sensor enhanced the availability of services, while the service composition solution ensured the system efficiently adapted to changes and failures in the environment. The framework included a novel probe based monitoring technique to actively collect performance data, and the use of an extended Petri net model, FPQSPN, to model performance of service composition. Howard Williams et al, 2006 proposed a personalized dynamic composition of services and resources in a wireless pervasive computing environment that provided dynamic service composition and re-composition based on the user’s personal preferences and current context. Maurice H. ter Beek et al, 2002 came out with the different type of challenges such as reliability, accessibility, exception handling/compensations, safety, security/trust, accuracy, availability and performance measured as response time, throughput and latency.

Incheon Paik et al, 2009 proposed Modeling and Transforming Abstract Constraints for Automatic Service Composition that consists of logical composition to produce an abstract workflow, followed by physical composition to transform it into a concrete workflow satisfying composition properties, such as Quality of service (QoS), preferences, and logic constraints. The composition properties were considered together, because they are abstract during the logical composition phase. Abstract properties in the logical composer were transformed to concrete properties for automated physical composition. This research investigated a stack of composition properties for QoS, preferences, and logic constraints considered together and architecture for automatic service composition, along with semi-automatic transformation of intermediate constraints in the architecture.
2.3 FAULT TOLERANT SERVICE SELECTION IN PERVERSIVE ENVIRONMENT

Moushumi Sharmi et al, 2005 proposed a SAFE-RD discovery mechanism as an integral part of MARKS. The resource manager component facilitated resource look up and efficient information dissemination. Providers’ consent scheme maintained the privacy of users and their willingness of sharing resources. Secret sharing algorithm avoided single point failure. Efficiency was achieved by the combination of “match best” and “match all” resource techniques for resource provider selection and resource lookup respectively. “The next best” provider was always selected. “Cellular automata” facilitated dynamic resource integration that consequently augmented the circumference of the resource usability. The SAFE-RD framework discussed the scenario of the moving away of the resource provider. SAFE-RD did not discuss the scenario of fault that could occur in the resource provider when executing a service. If the next best match stored is already used by some other user then the algorithm had to be executed again to find the next resource provider.

Shameem et al, 2009 proposed Self Healing for Autonomic Pervasive Computing (SHAPC) that stored all the crucial information’s including log status of the faulty device. The healing manager re-collected all the information for the device to restore to its previous condition. Information distribution process distributed the essential information among the other existing devices. This process assisted the faulty device to securely maintain all the important information’s. Re-assignment process was responsible for finding an alternate device that was available and compatible with the faulty device that was required for smooth functionality. The main drawback of SHAPC is that the system requires user intervention whenever the selection of the service was based on the
user’s preferences. Shameem et al, 2005 proposed a middleware service for pervasive advertisements to improve mobile business. The authors considered ubiquitous access, privacy and security. The middleware did not consider communication failures or network failures. The main drawback was that the system required user intervention, if the selection of the service was based on the user’s preferences.

Peizhao hu et al, 2008 proposed a model-based autonomic context management system for pervasive computing that dynamically configured and reconfigured its context information by gathering and preprocessing functionality, which provided fault tolerant provisioning of context information. The approach used standard based descriptions of context information sources that increased openness, interoperability and scalability of context-aware systems. The model saved energy, communication and processing resources, as sensors were attached to the context management system and activated dynamically. Peizhao hu et al, 2008 discussed the fault due to sensor failures but had not considered other failures such as communication failures, service failures, application failures and network failures.

Amir Padovitz et al, 2008 proposed an ECORA framework for context-oriented pervasive computing and reasoned about context under uncertainty. The framework followed an agent-oriented hybrid approach, combining centralized reasoning services with context-aware, reasoning capable mobile software agents. Amir Padovitz et al, 2008 stated that the following combination was important to develop an adaptive context-aware pervasive computing system. They were (1) a unifying context model with algorithms to reason about context under uncertainty, (2) event-based communication as an awareness mechanism, and (3) the ability of
components to move as an agility mechanism. It did not consider the communication failure.

Weigang Wu et al, 2008 proposed a permission-based message efficient mutual exclusion (MUTEX) algorithm for mobile ad hoc networks (MANETs). The messages cost were reduced by the “look-ahead” technique that enforced MUTEX only among the hosts currently competing for the critical section. The proposed algorithm tolerated link or host failures, using timeout-based mechanisms and was able to handle dozes and disconnections of mobile hosts. Permission based MUTEX algorithm was efficient, reliable and independent of any logical topology. The MUTEX based algorithm fails when there is a communication fault.

Koushanfer et al, 2002 proposed heterogeneous back-up scheme that addressed the problem of embedded sensor network fault tolerance, where one type of resources was substituted with another. The heterogeneous fault tolerance techniques for sensor networks included the ones where communication and sensing were mutually backing up each other. The heterogeneous back up scheme provided a low cost, low overhead, high resilient fault tolerant technique but it did not consider the application failure. Themistoklis et al, 2010 proposed a Starfish based self-healing framework that followed the Self-Managed Cell architectural paradigm. Starfish was an instantiation of an SMC for wireless sensor networks. It had an embedded policy system that allowed reconfiguration on individual nodes, remote access control to remote resources. It supported adaptation on nodes thereby allowing deployment of new strategies at run-time. Starfish based self healing framework enabled to recover only from sensor failures and did not consider other faults in pervasive computing.
Shiva Chetan et al., 2005 studied the various classes of failures, their implications to pervasive computing and the challenges to be addressed in designing a fault tolerant pervasive computing system. The failures where classified as device, application, network and service. Life hazard, security and inappropriate resource control and usage were some of the implications of the failure. Kaouther Abrougui et al., 2012 proposed a fault tolerant location based service discovery protocol for vehicular networks that addressed service provider failures, communication link failures and roadside router failures. The protocol permitted the discovery of location based services where the requester specified the region of interest within the request. The service discovery messages were integrated into the network layer and channel diversity was also used.

2.4 SERVICE SELECTION IN SOCIAL NETWORK SERVICES

Hsi-Peng Lu et al., 2010 broadly classified the users of social network into two categories as Extroverts and Introverts. The factors such as social value, emotional value, value of money and quality value were studied and were found that extroverts had more impact in the social network than the introverts. It was also been found that many were reluctant to pay for the services provided by the social networking sites paving way for the lack of a viable revenue model. A research model was built and the control variables used were gender, age, and personal income that influenced user intention to a larger extent. The income affected the expenditure while individuals of different age and gender had different perceptions of subscription to an SNS. Fred Stutzman et al., 2011 had discerned about the factors mediating the disclosure of social networking sites such as the privacy attitudes, privacy behavior, Privacy policy consumption and disclosure behavior. Based on the evidence from the survey, it was ascertained
that the social network sites could help mitigate concerns about disclosure by providing transparent privacy policies and privacy controls.

Teresa Correa et al, 2010 suggested that the factors such as extroversion, emotional stability and openness to experience were related to use of social applications on the Internet. The experimental results revealed that while extroversion and openness to experiences were positively related to social media use, emotional stability was a negative predictor, controlling for socio-demographics and life satisfaction. The findings differed by gender and age. Ohbyung Kwon et al, 2010 proposed a Technology Acceptance Model (TAM) to construct an amended model that focused on three individual differences: social identity, altruism and telepresence. The users’ perception was based on either human relationship-oriented service or a task-oriented service. Based on the experimentation of the users’ perception, the perceived encouragement and perceived orientation were found to be significant constructs that affect actual use of social network services. The experiment was conducted within a specific age group of 20 to 30 years and with limited type of services. Flora S.Tsai et al, 2009 developed mobile social software which helped to bring people together by discovering, communicating and sharing resources through mobile devices. The software was based on peer-to-peer technology and was tested on various mobile devices. The mobile social software allowed users to discover, communicate and share resources with one another. The three features of designing were object-oriented software design, network infrastructure design, and user-interface design.

Sonia Ben Mokhtar et al, 2009 had proposed a middleware which provided the concept of social networking in the pervasive environment. It enabled users to accurately recommend the activities by dynamically combining both the social and physical proximity relations. Social network propagation was classified
into two types. They are i) intra activity and ii) inter activity. The social network middleware had two proximity models: i) social proximity model and ii) physical proximity model. Recommendations were calculated based on the utility function given below:

$$\text{Utility}(A,B, \text{act}) = \alpha \times \text{SocialProximity}(A,B, \text{act}) + \beta \times \text{PhysicalProximity}(A,B)$$

Social preferences such as users’ social networks and the mobility patterns were considered while selecting a particular activity.

Qin Gao et al, 2010 made an extensive study and identified the factors that affected the social networking. The main factor considered for the success of social networking was found to be sociability. Apart from these there were many factors categorized under the topics such as purpose and benefit, people, social climate, mediated communication and technological system which had an impact on the user’s perception, performance and the choice of the social networking sites. Even though system competency was not a sociability factor, still it influenced the user’s experience to a greater extent. André C. Santos et al, 2010 proposed a methodology where the sensors play a major role to study the environment of the user. The methodology made use of sensors available in the mobile device as well as sensors externally connected via Bluetooth to provide user contexts. The system architecture consisted of the following concepts: i) sensor data acquisition to feature extraction, ii) context inference and iii) the publication of context information in web-centered servers in order to social networking services. To identify the context during runtime, decision trees were used for context inference. Based on the sensor data, required services are provided to the user. Dong-Hee Shin, 2010 presented the security, trust, and privacy concerns of the users with regard to social networking websites among
consumers using both reliable scales and measures. The author proposed a Social Network Service acceptance modeled by integrating cognitive and affective attitudes as primary influencing factors such as security, privacy, trust, attitude, usage, and intention. Kuan-Yu Lin et al, 2011 explored the factors that affected the user’s joining in the social networking sites. The author proposed a Structural Equation Modeling (SEM) approach and found enjoyment was the most influential factor in people’s continued use of SNS, followed by number of peers, and usefulness. The model performed clustering analysis by gender and found notable difference.

Luca Maria Aiello et al, 2012 proposed a framework LotusNet, for the development of social network services that relied on a peer-to-peer paradigm. The framework supported strong user authentication. LotusNet, a DHT-based OSN that focused on three strictly-interconnected aspects related to OSNs: security, privacy and services. Privacy was further classified into confidentiality, ownership privacy, interaction privacy and activity privacy. Security was classified into channel authentication, integrity, authentication and non-repudiation. Service requirement was classified into content availability, flexible communications, easy integration search facilities and reputation management. An increased awareness on privacy of personal information in centrally-managed Online Social Networks (OSNs) was strengthened among Social Network Services (SNSs) users. The content stored in the DHT was returned to the user only with a proper grant, signed by the owner.

2.5 SERVICE SELECTION IN HEALTH CARE SERVICES

Recently many researchers have focused on mechanisms to select appropriate health care provider from a group of health care providers.
Information technology in health care (Monica D. Oliveira et al, 2008; Athanasia Pouloudi, 1999) had played a major role in keeping people informed about the issues related to the health care services and the preferences affecting health care providers.

Jan J. Kerssens et al, 2004 compared the criteria based on which, the patients evaluated the quality of the health care in European countries. The study stated that the General Practitioner should have the following qualities:

i) understand the problem of the patient,
ii) contribute to the decision and treatment,
iii) should always be on time for appointment,
iv) should be able to explain the prescribed medicines in the way the patient can understand.
v) Less waiting time
vi) Could reach through telephone in times of emergency

The study also discussed the patients’ expectation in selecting a health care. They were:

i) Immediate attention in emergencies and reasonable waiting times for non-emergencies.
ii) Amenities of adequate quality.
iii) Access to social support networks for people receiving care.
iv) Choice of provider or freedom to select the individual or organization to deliver care.

Among the various criteria, availability, waiting time, respect for the patients and confidentiality were some of the criteria chosen for evaluation. Ronelle Hutchinson, 2010 identified that access and availability of care, information provision to patients, privacy and confidentiality of care, continuity of care, communication skills of clinical staff and interpersonal skills of clinical staff
affect the patient’s preference of choosing a health care provider. The issues of access and availability of care were listed below:

i) waiting times to get an appointment

ii) the way in which the patient makes appointments or gets advice over the phone from one of the clinical staff members

iii) the length of standard consultations

iv) the costs of services and associated billing processes

v) the normal opening hours

Richard Grol et al, 1999 performed a study that determined the priorities of patients and the difference in views of patients from different countries. The authors also outlined the patient’s expectations in the health care system. They were

i) Preparing the patients for what to expect from specialists or hospital care.

ii) Help in dealing with emotional problems related to the health status.

iii) Offering the services for preventing diseases.

iv) Getting through to the practice on the phone.

v) Waiting time in the waiting room.

Weinman J., 2001 provided an overview of psychological studies of doctor–patient communication. It focused on three linked components, namely the input factors which the patient and doctor bring to the consultation, the interactional processes which occur during the consultation and the short, long-term outcomes for the patient. Chon Abrahama et al, 2011 performed a detailed case study that facilitated the provision of providing health care services to the people of Japan. The study revealed the aspects of governmental policy that was effective in promoting successful Health care with IT initiatives in Japan in order
to solve challenging social issues regarding healthcare delivery. It also provided some desired autonomy for healthcare organizations and/or governments in medical communities and allowed the current resources of the advanced organizations to be leveraged. Insights from the case study had brought forth refinement concerns of the policy such as: i) the necessity for leadership and IT knowledge in the medical communities, ii) provider incentives, iii) legislation regarding accountability, security, privacy and confidentiality, iv) inclusion of stakeholders in solution development, and v) creating sustainable business models.

Connell N.A.D. et al, 2007 proposed a conceptual model for evaluating the healthcare information systems from the enterprise perception. Colin Haigh Smith et al, 1989 classified the criteria that affected the health care selection as i) criteria originated by the government and ii) criteria originated by the patients. The criteria used by the government and patients were tabulated below.

<table>
<thead>
<tr>
<th>Criteria originated by government</th>
<th>Criteria originated by patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health education provided</td>
<td>Friendly and encouraging staff</td>
</tr>
<tr>
<td>Easy to change to another doctor</td>
<td>Staff you know personally</td>
</tr>
<tr>
<td>Surgery times when patients want them</td>
<td>Doctor who is not hurried and listens</td>
</tr>
<tr>
<td>Regular health checks for adults</td>
<td>Waiting time &lt;20 minutes</td>
</tr>
<tr>
<td>Premises well decorated and convenient</td>
<td>Nurse working on the premises</td>
</tr>
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Berkelmans GJ et al, 2010 identified the preferences of the senior citizens in relation to the non-medical attributes of GP care. The study aimed to improve the understanding about preferences of the patients in relation to non-
medical attributes of primary health care, to develop strategies to improve the quality of care that senior citizens receive from their General Practitioner. They were i) continuity of care, ii) distance to practice, iii) accessibility, iv) waiting time, v) attitude, vi) information, vii) proactive initiatives and viii) expertise and trust.

Matthew J. Liberatore et al, 2008 proposed the application of the analytic hierarchy process to important problems in medical and health care decision making. The application domain was categorized based on the diagnosis, patient participation, therapy/treatment, organ transplantation, project and technology evaluation and selection, human resource planning, and health care evaluation and policy. Athanasia Pouloudi, 1999 developed NHSnet in the United Kingdom that reviewed the different context of health-information exchange. It discussed the features that can be incorporated by the healthcare policy makers.

Marianne C. Maassa et al, 2008 performed a detailed case study based on the usefulness of a Regional Health Care Information System in primary care. The study had revealed that cost is the main factor that influences the health care system. Ludwick D.A. et al, 2009 performed a study on the experiences of adopting the health information system in seven countries. Dominikus Herzberg et al, 2009 proposed an approach to user-interface and interaction design for specifying computer-based counseling systems in health care for medical doctors to inform, motivate and challenge their patients according to a well-defined therapeutic goal. The design, development and implementation of such systems require close collaboration between users, i.e. patients, and developers. While this is true of any software development process, it can be particularly challenging in the health counseling field, where there are multiple specialties and extremely heterogeneous user groups. In order to facilitate a structured design approach for
counseling systems in health care, the approach had been modeled as an iterative three-staged specification process, which enabled early involvement of potential users in the development process, and a specification language, which enabled an author to consistently describe and define user interfaces and interaction designs in a stepwise manner.

2.6 SERVICE SELECTION IN CLOUD COMPUTING

In recent years, many researchers have focused on proposing feasible mechanisms to select appropriate service providers from the cloud. Some of the proposed service selection schemes were using replication (Patrick Wendell et al, 2010), ranking (Laiping Zhao et al, 2012), cluster based searching (Andrzej Goscinski et al, 2010) techniques. Patrick Wendell et al, 2010 proposed DONAR, a distributed system that provided an interface to specify the mapping policies. The distributed mapping nodes executed an algorithm that coordinated the replica selection decisions for users. The protocol considered both client performance and server load, and proved that the algorithm was stable and effective. But DONAR did not consider the user preferences such as time, cost etc.

Laiping Zhao et al, 2012 proposed a Service Provider Search Engine (SPSE) innovative service selection algorithm that would find the appropriate service considering the user’s multiple QoS requirements. The QoS requirements considered were service’s response time, trust degree and monetary cost. It was found that it could capture user’s preferences value in less than six times of job submissions. Even if the user preferences had changed, the preference value would be recaptured. SPSE had not considered the fault tolerance and pre emptible issues in the service scheduling problem for SOA systems. SPSE had not discussed about the performance when more QoS factors were considered. Andrzej Goscinski et
al, 2010 proposed a technology for publication, discovery and selection based on dynamic attributes. The dynamic attributes expressed the current state and characteristics of cloud services and resources. The technique was an application of the Resources via Web Services middleware (RVWS) to offer higher level abstraction of clouds in the form of a new technology. Cluster concept allowed easy publication, discovery and selection via a simple interface using Web pages. Instead of spending time and effort locating, evaluating and learning about clusters, clients were able to easily discover, select and use the required resources. This was considered as an important feature for considering this new technique. RVWS middleware had not discussed about user personalization.

Jing Zhou et al, 2011 proposed unstructured P2P paradigm for service discovery in cloud. A hybrid search scheme was proposed for service query routing that couples with a number of components including one-hop replication, semantic-aware message routing, topology reorganization, and supernodes for enhanced system performance. The concept of semantics to both query message routing and topology reorganization played an important role. QoS parameters were not considered in the P2P paradigm. Gabor Kecskemeti et al, 2011 proposed an automated virtual appliance creation service that aided the service developers to create efficiently deployable virtual appliances. The effectiveness of service deployment systems affected initial service response times. The algorithm decomposed the virtual appliances in order to replicate the common virtual appliance parts in IaaS systems. Those parts were used to reduce the deployment time of the service by rebuilding the virtual appliance of the service on the deployment target site. In order to reduce the service cost a solution was proposed based on the partial replication of virtual appliance contents where the replicated parts were defined automatically by a decomposition algorithm and a mechanism to rebuild the decomposed virtual appliances on the target site. The automated
virtual appliance creation helped the reduction of the service cost from user perspective and stated that service cost plays a major role in service selection.

Taekgyeong Han et al, 2010 proposed Cloud Service Discovery that consisted of Cloud Service Reasoning Agent, an agent-based discovery system that consulted ontology when retrieving information about Cloud services. Cloud Service Reasoning Agent enabled the service discovery to reason about the relations of Cloud services and rates the search results. Cloud ontology enabled the agent to determine the relations of Cloud services using three service reasoning methods namely, Similarity, Equivalent and Numerical. Cloud ontology was successful in finding Cloud services that were closer to users’ requirements. Multiple criteria were not considered.

Arkaitz Ruiz-Alvarez et al, 2011 proposed an automated approach that selected the best cloud storage service of a given application. The approach relied on a machine readable description of the capabilities of each storage system processed together with the user's specified requirements. The result was an assignment of datasets to storage systems that had multiple advantages. They were, the resulting match met the performance requirements and estimated cost. The users were allowed to express their storage requirements using high-level concepts rather than reading the documentation from different cloud providers. Since the approach was based on machine readable description, it was suitable only for storage service. Shangguang Wang et al, 2011 proposed a mixed integer programming model to select optimal services. The model first computed the QoS uncertainty to prune redundant services in order to extract reliable services. The next best match is not considered by the model. Shangguang Wang et al, 2012 proposed a fast service selection approach by using fuzzy logic control. The approach had adopted fuzzy logic control to support fast and dynamic service
selection and mixed integer programming assisted users to obtain suitable services.

Xue-Long Wang et al, 2011 proposed a Service Selection Constraint model that used the dynamic configuration method of Web service composition. The functional dependency relationships between component services were defined as the service selection constraints. The Pareto optimal solutions were searched by a special ant colony optimization algorithm for Web service. Wuqi Gao et al, 2012 proposed cloud simulation scheduling algorithm based on multi-dimension QoS. Analytic hierarchy process was introduced into the Resource scheduling algorithm to compute every dimensional parameters weight, and then the tasks were allocated to appropriate resource according to customer satisfaction, QoS distance and loading equilibrium, etc. Yu Dingguo et al, 2011 proposed a trust cloud-based subjective trust assessment and management model. The model provided the design of trust cloud, the policy of the obtainment to compute the trust information and supplied trust decision based on trust cloud model.

Amir Mohamed Talib et al, 2011 proposed Multi Agent System (MAS) Architecture using Prometheus, an agent-oriented software engineering methodology. The methodology propagated information that ensured consistency between various parts of the design. The proposed MAS architecture includes five types of agents: cloud Service Provider Agent, cloud Data Confidentiality Agent, cloud Data Correctness Agent, cloud Data Availability Agent and cloud Data Integrity Agent. Xiaoqin Fan et al, 2010 proposed Niche Particle Swarm Optimization algorithm. The algorithm was an integration of Simulated Annealing (SA) and niche technique into Particle Swarm Optimization (PSO) that inherited the rapid local search ability of PSO and global convergence of SA. Keting Yin et al, 2010 proposed QoS-aware services selection for web service
composition in multi network environment. The service selection approach was based on Integer Programming that met the requirements in multi-network environment. Chaudhary Sajjad Hussain et al, 2008 proposed service discovery and controlling of services with Ubiquitous Remote Manager helped to find the appropriate service according to the user preference.

Yun-Young Hwang et al, 2012 proposed semantic-based service substitution that overcame service substitution and service similarity problems that occur in the service-oriented community after the service discovery and service composition problems such as unavailability. Liguo Liu et al, 2010 proposed a Virtual device that focused on the autonomy of a device. Virtual device had function agents that had the ability for auto-configuration, auto-announcement, auto-service discovery.

2.7 CONCLUSION

It is evident from the literature that there are many requirements that influence the selection of the service providers in pervasive and cloud environments. These requirements also vary for different applications. Therefore, service selection is an important research challenge as it requires an efficient selection of best service providers based on user preferences.