Chapter XXIX

The Influences and Impacts of Societal Factors on the Adoption of Web Services

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ABSTRACT

The objective of this chapter is to identify and analyze implications of social factors on the adoption of Web services technology. Web services allow organizations to streamline their business process applications and expand their market boundaries to global level. Currently, adoption of Web service technology is in the early phase, as organizations are experimenting with it behind secured firewall. Technological immaturity and cost of adoption are considered as primary factors for slow adoption of Web services technology. However, global reach of Web services allows it to be used in different cultural, geopolitical, and infrastructural conditions. Therefore, this chapter explores influences and impacts of societal factors on the adoption of Web service technology. Societal factors considered in this study are culture, social structure, geography, ethics, and trust. Common themes identified across these factors are need for mechanisms to support globalization management, to monitor and assess trustworthiness, and relationship management.

INTRODUCTION

Over the years, the Internet infrastructure has emerged as a technological platform for enterprise applications to access and share information (Alonso, Casati, Kuno, & Machiraju, 2004). The growth of Internet with technologies such as eXtensible Markup Language (XML) has changed the way business collaboration are supported (Benatallah, Dumas, Fauvet, & Rabhi, 2003). In particular, Web service, which is built on top of existing Internet infrastructure, provides an
open and XML-based standardized framework for application-to-application interaction.

Web service, following Service-Oriented Computing (SOC) paradigm, promises to solve problems of application integration. The SOC paradigm provides characteristics of loose coupling and dynamic binding by positioning its basic essence of computing as a “service” (Curbera, Khalaf, Mukhi, Tai, & Weerawarana, 2003). Software application (service) developed following SOC paradigm defines their functional requirements and capabilities in standardized machine-readable format. Services represent the basic building blocks, which can be combined in particular ways to achieve business goals. Moreover, Web service is a collage of standards and technologies (Sleeper & Robins, 2001), which allows applications to communicate with each other, regardless of language or platform it was developed and location of the application on the Internet (Manes, 2003). Thereby, solving problems of tight coupling, hard-coding, and heavy-handed implementation of application integration.

Web services technology has received significant amount of attention from both academicians and practitioners. Despite growing interest and recent efforts, Web services is confronted with several critical problems that severely undermines usability of Web services and therefore hindering widespread adoption (Ran, 2003; Umapathy & Purao, 2007b). In organizational context, adoption of new technologies such as Web services can be described as commitment to invest resources towards implementing and using a technology to support core business functionalities (Magnusson, 2004; Rogers, 1995).

There are few research articles that provide analysis on factors affecting the adoption of Web services technology in organizations. There have been some research works on understanding technical factors that affect development of Web services (Gottschalk, Graham, Kreger, & Snell, 2002; Papazoglou, 2003; Tsalgatidou & Pilioura, 2002). There also have been some research works to understand Web service adoption from the business and industrial perspectives (M. Chen, 2003; Ciganek, Haines, & Haseman, 2006; Haines, 2004; Tilley et al., 2002). Primary factors for slow adoption of Web services technology are considered to be technological immaturity and cost of adoption (A. N. K. Chen, Sen, & Shao, 2006; Ciganek et al., 2006).

Web services not only changes the way of conducting business for organizations; it also helps them to streamline business process applications and expand their market boundary to global level. Even though strategic driver for Web services has been organizational needs, the adoption of Web services has social implications. Global reach of Web services allows it to be used in different cultural and infrastructural conditions. Therefore, adoption of Web services technology impacts software development, nature of enterprise systems jobs, and how businesses operate (Ciganek et al., 2006). Therefore consideration of social factors is very important while developing and adopting Web services technology.

Whenever the meaning of context has moved beyond organizational level to include societal and global level, the information systems discipline has been confronted with significant challenges (Walsham, 2000). As Web services technology allows organizations to collaborate with global partners, understanding implications of societal factors are highly important before the heavy investments of resources are made for developing and implementing Web services. However, implications of social factors on Web services are severely under-researched.

The objective of this study is to identify social factors that can influence and impact on the adoption of Web services technology. Walsham (Walsham, 2000) suggests that study of use of information systems in different cultural contexts will be social level of analysis. Therefore, this study would be conducted at the societal level of analysis and utilize the influence/impact framework (Trauth, 2000) to understand the societal
implications of the adoption of Web services technology.

**SOCIETAL FACTORS CONSIDERED FOR ANALYSIS**

Pouloudi and Vassilopoulou (N. Pouloudi & Vassilopoulou, 2002), drawing upon several social and cultural theories, has identified following factors to have social implications on the adoption of electronic business models: culture, legal/regulatory/policy, economic/ethical/professional, and region/geography. Even though Web services is about conducting business electronically, analysis on electronic business models are not applicable to Web services, because it uses service-oriented architecture which is not tailored towards any specific business models. However, these factors are still good starting point for understanding implications of societal factors on the adoption of Web service technology. Therefore, factors considered for this study are: culture, social structure, ethics, region/geography, and trust.

The influence/impact framework (Trauth, 2000) is used to understand the societal implications of the adoption of the Web services. According to the influence/impact framework, there are two forms of interaction between society and information sector. First, societal factors exert an influence on the way in which the information sector develops and behaves. Second, there is a subsequent impact that the information sector has on the society, in our case, Web service community. In this study, influence/impact framework will be used to understand interaction between social factors and the adoption of Web services technology. Above listed factors are analyzed to investigate the influences of the social factors on the adoption of Web service technology and subsequent impacts for Web service community to facilitate the adoption of Web services. Below, a brief overview of the culture, social structure, ethics, region/geography, and trust factors are provided.

**Culture**

Increasing maturity of Internet-based technologies is enabling organizations to redesign their information systems to support business activities over the Internet (Straub, 2004). Organizations can utilize Web service technology platform to assemble individual applications into a value-added services. These individual applications can be developed by globally distributed developers, who may have diverse cultural backgrounds. Therefore it is necessary to understand the influences and impacts of the culture before developing and adopting Web service technologies.

Hofstede (Hofstede, 1980) defines culture as, “the collective programming of the mind which distinguishes the members of one human group from another”. Hofstede (Hofstede, 1991) has proposed five dimensions of national culture; these five dimensions will be analyzed in this chapter:

- **Power distance**: Is the extent to which a society accepts unequal distribution of power in institutions and organizations. Power distance represents the extent of adherence to formal authority channels and is the degree to which the lesser powerful accept the prevailing distribution of power. High power distance cultures have members who are much more comfortable with centralized power than members of low power distance cultures.

- **Individualism vs. collectivism**: Refers to the basic level of behavior regulation, whether by individuals or groups. People high on individualism view self and immediate family as relatively more important than the collectivism. Individualism is the extent to which an individual in society looks after own interest rather than the group.
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- **Masculinity vs. femininity:** Masculine culture is assertive, tough, and concentrates on material success while feminine culture is modest, tender, concentrate on quality of life, and human relationships at the forefront.

- **Uncertainty avoidance:** Is the extent to which a member in the society feels threatened by uncertain or unknown situations, as well as feels the importance of rules and standards. People with an orientation low on uncertainty avoidance prefer situations that are free and not bound by rules and regulations.

- **Short-term vs. long-term time orientation:** Is the extent to which society members give value to fostering virtues oriented towards future rewards. Short-term vs. long-term orientation is people’s basic reference period. Short-term orientation involves tendencies towards consumption and maintaining materialistic status, while long-term orientation suggests thrift, perseverance, following tradition, and deferred satisfaction.

**Social Structure**

Giddens (Giddens, 1984) developed theory of structuration in where he suggests that human agency and social structure are related to each other. According to the theory of structuration, the social structure is the basis for individual actions and the actions of individual agents reproduces the social structure. The social structure is defined as patterns of actions, that is., virtual order of actions and modalities (i.e., rules and resources). Actions take place in structural areas, which are formally described as: signification, domination, and legitimation. These three factors will be analyzed in this study. Signification refers to structural features of social systems, drawn upon, and reproduced by actors in the form of interpretive schemes. Signification is a constitutive feature of the context of communication itself. Domination is facilities like authoritative resources, which extends over people and allocative resources, which extends over objects or material phenomena. Legitimation is the norms and/or rules that individuals draw on for justifying their own actions and that of others. Detailed summary of the theory of structuration can be found at (Rose, 1998).

**Ethics**

Ethics are defined as a set of standards, or value system by which free, human actions are ultimately determined as right or wrong, and good or evil (White & Wooten, 1986). During targeted market expansions, developers tend to put business-ethics consideration on back burner in order to avoid unduly limitations (Rebne, Ng-Kruelle, Swatman, & Hampe, 2002). Increasing usage of the Internet-based applications makes it difficult to differentiate business actions performed within an organization context and outside; therefore, ownership of business actions performed should be identified (Card, 2005). In the Internet-based markets, organizations have expectation on their partners to provide fair conditions such as fair price, and fair market value (Askland, 2000). Organizations must provide secured means to their partners and employees to access confidential information (Seo & Sycara, 2006). Therefore, factors that will be analyzed in this paper are ownership, fairness, and use of confidential information.

**Region/ Geography**

Geography can be defined as “a large land area that has particular geographic, political, or cultural characteristics that distinguishes it from others whether existing within one country or extending over several” (N. Pouloudi & Vassilopoulou, 2002). In the organizational context, region/geography refers to issues that are related to specific geographic areas such as linguistic singularities of specific regions and environmental issues such as rules ranging from legal mandates to industry best practices (Kotok, 2001). Therefore, factors
that will be analyzed in this paper are language (vocabulary) and environmental issues (country laws, policies, and regulations).

**Trust**

With the accelerated adoption of electronic collaboration and commerce, organizations can now outsource their information technologies, rather than owning and maintaining their own systems (Ratnasingam, 2002). The geographical dispersion of outsourcing partners, introduces challenge of building a degree of trust needed for effective collaboration (Lederer-Antonucci, Greenberg, Muehlen, & Greenberg, 2003). It is highly necessary to have some notions of trustworthiness of the partners, before they are allocated to perform a selected task in the business process. In the context of Web services, applications developed by globally dispersed partners can be used to support business processes, therefore, trustworthiness of such partners must be managed to permit quicker development Web service applications.

Trust can be defined as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer, Davis, & Schoorman, 1995). Trust is an important component that determines the nature of interactions and people’s expectations in social and business environments (Gefen, 2002). Trustworthiness of network systems is multi dimensional issue involving technology and people. A trustworthy system performs its expected tasks irrespective of environmental disruption, human user and operator errors, and hostile attacks (Schneider, 1999). Trustworthiness of network systems encompasses reliability, security, privacy, safety, survivability and prior experience, thus, these are factors that will be analyzed.

• **Reliability**: Is the capability of system, to perform consistently and precisely according to its design with high confidence.
• **Security**: Is capability of a system to ensure that it can resist potentially correlated attacks. Security generally refers to a collection of safeguards that ensure confidentiality of information, protect system(s) or network(s) that process information, and controlling access to information. Security typically encompasses secrecy, confidentiality, integrity, and availability.
• **Privacy**: Ensures freedom from unauthorized intrusion.
• **Safety**: Is a characteristic of trustworthiness asserting that a system will not be cause of physical harm to people or property.
• **Survivability**: Is the capability to provide a certain level of service in adverse or hostile conditions
• **Prior experience**: Refers to experience with the particular market space, with the particular participant, with particular technology and/or with the particular tradable item.

**INFLUENCE/ IMPACT ANALYSIS**

**Culture**

Power distance represents the degree to which less powerful accept prevailing power distribution and extent to which they adhere to formal authority channels (Pavlou & Chai, 2002). Members with low power distance would prefer decentralized environment while members with high power distance would prefer centralized environment. In the context of Web services, services (i.e., software applications) are distributed and easily accessible via Internet protocols. Web service composition allows invocation of individual services to be arranged in specific order to achieve a business
goal. In regards to executing such composite services, members of high power distance would prefer a centralized mechanism, i.e., they would like to be aware of what ordered tasks need to be executed and required peer-to-peer interactions to accomplish each task. While members of low power distance might prefer to receive information on only ordered tasks that need to be completed and manage coordination required to achieve the task on their own. In the context of composite services, orchestration standards such as WS-BPEL (WS-BPEL, 2007) is used for describing sequence of tasks that must be performed by participating services in order to achieve the business goals; and choreography standards such as WS-CDL (WS-CDL, 2005) is used for describing peer-to-peer collaborations between multiple participants required to achieve the business goals (Umamapathy, 2006). Thus adoption of Web service, pertaining to composite services could be influenced by power distance of service providers, i.e., members of high power distance might prefer using both orchestration and choreography mechanisms while members of low power distance might prefer using only orchestration mechanism. Therefore, during development of composite services, high and low power distance culture characteristics needs to observed and appropriately balanced.

With respect to individualism and collectivism culture, members of individualism generally are not affiliated towards maintaining a long-term relationship. On contrary, member of collectivist are focused on maintaining harmony in the group by going along with common goal of the group. Collectivist, thus are geared towards having a long-term business relationships, while individualism do not seek it purposely (Pavlou & Chai, 2002). Members of individualism cultures would be more interested in dynamic Web service composition, where composer assembles unknown services on the fly to provide value-added composite services. In order to facilitate dynamic Web service composition, individualism members would seek means to evaluate trustworthiness of the service providers, rather establishing a relationship and maintaining it. On the other hand, members of collectivist cultures would depend on their existing business relationship to construct composite services, therefore, they would seek for relationship management that will allow them to establish and maintain long-term relationship.

With respect to masculine and feminine cultures, members of masculine cultures emphasize work and material accomplishments while members of feminine cultures put human relationships at the forefront (Pavlou & Chai, 2002). Members of masculine cultures, thus, would expect clear separation between roles of the partners in composite services; while members of feminine cultures generally would not seek such a clear separation. These cultural differences affect the design and execution of composite services, therefore, roles and actions performed by partners should be made explicit. PartnerLink element in the WS-BPEL specification is tailored towards addressing this issue (WS-BPEL, 2007).

Uncertainty avoidance represents extent to which people feel threatened by ambiguity (Davis & Ruhe, 2003). Members of high uncertainty avoidance orientation would prefer situations where there exist standards and rules of engagement, while members of low uncertainty avoidance orientation would prefer situations that are free and not bound by rules and regulations (Pavlou & Chai, 2002). Web service utilizes Internet infrastructure, which has high degree of uncertainty, to conduct business transactions (Tsogankov, 2004). Members of high uncertainty avoidance orientation would seek for adequate standards and protocols that can provide means to conduct secured and reliable transactions. On other hand, members of low uncertainty avoidance orientation would seek for flexibility on manner which transactions are carried out using such standards and protocols.

Short-term and long-term orientation represents people’s basic reference period. Members of short-term orientation would have tendency
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Towards consuming resources and maintaining materialistic status, on contrary, members of long-term orientation would have tendency to follow tradition, defer satisfaction, and have perseverance to be thrifty (Pavlou & Chai, 2002). Members of short-term orientation would take risk of utilizing immature technology like Web services to conduct business; therefore, there is high likelihood that members of short-term orientation would be the first adopters of the Web services technology. Members of short-term orientation would desire for immediate results and achievement of goals, therefore, would risk to use certain aspects of Web service technology that provide reliable and superior mechanisms. Members of long-term orientation would focus on practical value of the system for organizations and be patience in achieving results, therefore, would be late adopters of the Web service technology and prefer all critical aspects of Web service technology to provide reliable and superior mechanisms. Figure 1 provides summary of influence/impact analysis for cultural factors on the adoption of Web service technology.

Social Structure

In organizational context, participant’s actions are constraint by his/her role within the organization. Actions performed by participants in a particular

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**Influences of cultural factors on the adoption of web services technology**

- Members of high power distance might prefer to use both orchestration and choreography mechanisms
- Members of low power distance might prefer to use only orchestration mechanism
- Need to support both ability to make short-term and built long-term relationship
- Need explicitly specific roles of partnering services
- Need regulations to conduct secured transactions over Internet
- Short-term oriented culture might be early adopters
- Long-term oriented culture might be late adopters

**Subsequent impacts on the adoption of web services technology**

- Balance cultures with low and high power distance while composing services by using orchestration and choreography mechanisms appropriately
- Develop mechanisms to evaluate trustworthiness of services
- Develop mechanisms to manage relationships
- Develop mechanisms to specific roles and actions performed by partnering services
- Develop standards and protocols for web services transactions
- Develop mechanisms to ensure secured and faster interactions
- Ensure all aspects of web service technology provide reliable and superior mechanisms
- Develop design principles to ensure web services development provides practical value of the system to organizations
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circumstance are not under control of organizations (Hassall, 2000). Thus, participants, systems, and organizations with which a person interacts should be considered holistically (Hassall, 2000). In the development of theory of structuration (Giddens, 1984), Giddens insists upon an action/structure duality, i.e., having balance between participants and organization structure, because by virtue of interacting with the organization, participant’s action are being constrained and at same time creating the structure(s) of the organization.

Signification deals with communication of knowledge and meaning which is achieved through stocks of knowledge that participants draw on, in the production and reproduction of action (Orlikowski & Robey, 1991). Through the use of modality of an interpretative scheme, signification can affect ways in which interactions are performed. Forms of significations can be changed via communicative actions performed through interpretative schemes (Hassall, 2000). Web service, therefore, should support different forms of exchanging messages among services. There must be multiple protocols through which services can receive and send messages. However, creation of multiple forms of communication protocols would lead to multiple schemes to interpret the message. Therefore, in the context of Web services, it is critical to develop standardized protocols to exchange and interpret messages unambiguously as well as maintain conversation context among all participants involved. Simple Object Access Protocol (SOAP) standard is tailored towards solving the issue of common protocol to exchange messages (SOAP, 2003). Service conversation specifications such as Web Services Choreography Description Language (WS-CDL) (WS-CDL, 2005) address the issue of maintaining context among participants (Umapathy, 2006).

Allocation of facilities, which enable participants to achieve specific outcomes, typically, depends on participants’ power. These facilities represent resources which comprise structures of domination (Nandan, 1996). Resources are means through which intentions are realized, goals are accomplished, and power is exercised (Orlikowski & Robey, 1991). Participants who has authoritative power for a specific resource/facility would act as coordinators and have power to reward or punish other participants, who are in need of that resource (Sarker & Sahay, 2003).

In the context of Web services, composer of a composite service would act as coordinator who co-ordinates interactions and resources utilized by the participants of the composite service. In order to achieve business goal, composer would require co-ordination protocols for managing and monitoring usage of resources by participants. Web Services Business Process Execution Language (WS-BPEL) specification provides means for composers to coordinate usage of resources by their partners (WS-BPEL, 2005).

Participants draw on rules of legitimation for interpreting their actions as well as other participants’ actions. Legitimacy of an interaction defines rules governing appropriate conduct within an organizational setting (Orlikowski & Robey, 1991). In the context of Web services, a composite service must describe rules associated for sequence of actions performed by participating services in order to achieve a goal. Web service conversation specifications such as WS-CDL (WS-CDL, 2005) and service composition process specification such as WS-BPEL (WS-BPEL, 2007) are tailored towards this need.

When the signification, domination and legitimation dimensions interplay with each other, they create and reproduce social structure causing relationship management issues (Sydow, 1998). In context of Web services, to manage interplay of these dimensions would require relationship management mechanisms. However, in the context of Web services, there is lack of well established mechanisms to manage relationships. Figure 2 provides summary of influence/impact analysis for social structure factors on the adoption of Web service technology.
The Influences and Impacts of Societal Factors on the Adoption of Web Services

Figure 2. Influence / impact framework analysis for social structure factors

<table>
<thead>
<tr>
<th>Influences of social structure factors on the adoption of web services technology</th>
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<tr>
<td>• Different forms to communicate</td>
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<td>• Maintaining context of interaction</td>
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<td>• Need of coordinator to manage and allocate resources</td>
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<td>• Need of describe interaction sequence and other associate rules to perform actions</td>
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<td>• Create and manage relationships</td>
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<tr>
<th>Subsequent impacts on the adoption of web services technology</th>
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<tr>
<td>• Develop standardized means to exchange messages over different communication</td>
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<td>protocols</td>
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<tr>
<td>• Provide protocol to maintain conversational contexts to co-ordination interactions among services</td>
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<tr>
<td>• Provide protocols to describe rules, resources to be used, and sequences of actions to performed by participating services</td>
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<tr>
<td>• Develop mechanisms to manage relationships</td>
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Ethics

The Internet infrastructure represents a cyberspace where there seems to be no limit on what is or what will be out there (Halbert & Ingulli, 2002). The growing number of well developed Internet-based technologies has revolutionized the way data is gathered, stored, manipulated, and communicated. Along with its development, this revolution is creating new ethical dilemmas. The speed and efficiency of these Internet-based technologies have forced people to confront new rights, responsibilities, and reconsider current ethical standards that were created before advent of this revolution. As in other new technological arenas, legal decisions lag behind technical developments, therefore, new ethical standards are required to fill the gap on how electronic information should be used via Internet-based technologies (Lynch, 2000).

Mason (Mason, 1986) suggests that there four key ethical issues in the information age, which are: accuracy, property, privacy, and accessibility. Property and accuracy raises the issues of ownership, such as who has information ownership and control, as well as the quality and accuracy of information held. With respect to property, the increasing use of Internet-based resources has created new contexts for the terms piracy and plagiarism (Barroso, 2001). Internet-based resources can be easily copied, altered, and transferred across borders. Therefore, the piracy of intellectual property is a major social problem in this context (Bynum, 2002). In the context of Web services, non-functional characteristics of services such as ownership, quality of services, and copyright of associated services should be shared by service providers with service consumers.

Privacy is concerned with capability of a people or system to keeping personal information confidential (Mason, 1986). There are many efforts from various societies around the world to design and implement national level schemes for Privacy and Data Protection (PDP) (Howley,
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Ethical decisions concerned with privacy of information are made in the context of complex relationships (A. Pouloudi, 1999). Therefore, the use of confidential information impacts on interpersonal relations (in particular trust) with the stakeholders. In the context of Web services, service providers should provide machine readable descriptions of their privacy policies along with details of how privacy concerns are controlled and enforced. Platform for Privacy Preferences (P3P) developed to tackle privacy concerns in Web environment can be further extended to support Web services environment (Carminati, Ferrari, & Hung, 2005).

Fairness is considered as a justice concept, where in, it can be described as an act of giving a person what s/he deserves (Britz & Zyl, 2004). The concept of justice can be categorized into four kinds: commutative justice, distributive justice, contributive justice, and retributive justice. Com­mutative justice is about fundamental fairness with regards to all agreements and exchanges among individuals or social groups (Nitsch, 2005). In the context of Web services, service consumers are free to select a service that provides competitive deal. Service providers, therefore, need to have fair and competitive pricing systems for their services. There should also be appropriate regulation to ensure that service consumers make required payments. Contributive justice refers to moral obligations of individuals to society for the common good (Britz & Lipinski, 2001). Contributive justice is about having accessible information infrastructure for all. In context of Web services, services are made accessible for everyone as they are provided via Internet protocols. Distributive justice refers to obligations of society to its individual members (Britz & Lipinski, 2001). Distributive justice can be considered as a norm with regards to fair distribution of resources required to satisfy basic human needs. Retributive justice concerns with punishing those who have violated laws devised to protect social order (Britz & Lipinski, 2001). These norms implies importance for service provider to have fairness in pricing their services, making services accessible by all, and ensure that services as well as providers and consumers are not violating any laws or regulations. Figure 3 provides summary of influence/impact analysis for ethics factors on the adoption of Web service technology.

Region/ Geography

Internet-based technologies and digitization of information have enabled organizations to operate across national borders with minimal constraints (Straub, 2004). Web, the fastest growing segment of the Internet infrastructure, provides most cost-effective medium for organizations to transfer customized and personalized information beyond geographical boundaries (Bakos, 1998). However, in order to effectively collaborate with global partners, organizations must overcome following challenges: developing trust and relationships with partners beyond geographical boundaries, understanding cross-cultural differences, developing intercultural communication competence, processing multilingual data, and presenting culturally correct information (Zakaria, Amelinckx, & Wilemon, 2004; Zhu, 2003). In the context of Web services, this calls for development of globalization management support mechanisms. Any such mechanisms should include critical features like building and maintaining relationships beyond geographical barriers, ontologies describing language, culture, regional and local contexts, multilingual data processing, localization of business model, and translation services. Currently, mechanisms to support globalization management of Web services are severely under-research.

While organizations are adapting their businesses to exchange information and perform transactions over the Internet infrastructure; Governments and the International bodies are creating new (or extending old) laws and regulations to protect their sovereignty. The growth of
these new laws and regulations presents political and legal challenges for organizations to collaborate with global partners. Some of the challenges faced by organizations are: protecting intellectual property rights, ensuring legally valid electronic contracts and transactions, understanding and incorporating changes in taxation (both in home and partner countries), understanding legal liability on information obtained from global partners, and understanding geo-political and legal business environments in the partners countries. In the context of Web services, the above challenges shows the importance of understanding global laws and regulations before using services provided by global partners. Organization adopting Web service technology to conduct their business with global partners must develop ontologies describing geopolitical and legal business environments of their partners’ countries, to address above challenges. Figure 4 provides summary of influence/impact analysis for region/ geography factors on the adoption of Web service technology.

**Trust**

The influence of consumer’s trust on online transaction activities is fundamental in predicting e-commerce adoption (Pavlou & Chai, 2002). Trust is an important element in influencing consumer behavior; hence, developing service consumer’s trust is critical for adoption of Web services. The openness and easiness of conducting transactions over the Internet infrastructure have increased concerns on privacy and security underscoring the importance of trust. In the context of Web services, because services are made accessible over the Internet infrastructure, they are prone for problems of accessibility, reliability, convenience, accuracy, and security (Tsygankov, 2004). Therefore it is highly necessary to have

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**Table: Influences of ethics factors on the adoption of web services technology**

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<tr>
<td>- Ethical dilemmas on usage of electronic information</td>
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<td>- Protecting from plagiarism of intellectual property</td>
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<td>- Protecting personal information</td>
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<td>- Fair pricing of services</td>
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<td>- Services should be easily accessible by anyone</td>
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<td>- Regulations to ensure providers and consumers not violating any laws</td>
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**Table: Subsequent impacts on the adoption of web services technology**

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<td>- Develop specifications to describe non-functional properties of service</td>
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<td>- Develop mechanism to verify ownership and copyright details of a service</td>
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<td>- Develop mechanisms to specify privacy policies</td>
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<td>- Develop mechanisms to enforce privacy and control access to confidential information</td>
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<td>- Provide appropriate models to set fair pricing for services</td>
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<td>- Provide automated means to ensure providers and consumers are not violating laws and regulations</td>
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Figure 4. Influence / impact framework analysis for region/ geography factors

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<th>Influences of region/ geography factors on the adoption of web services technology</th>
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<tr>
<td>• Understanding cross-cultural differences and local contexts</td>
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<td>• Overcoming linguistic barriers</td>
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<tr>
<td>• Maintain relationships with partners across globe</td>
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<tr>
<td>• Understand laws and regulations in partner countries</td>
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<tr>
<td>• Ensure electronic transactions follows regulations in both home and partner countries</td>
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<th>Subsequent impacts on the adoption of web services technology</th>
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<tr>
<td>• Provide ability to process and present multilingual data</td>
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<td>• Develop mechanisms to support globalization management</td>
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<tr>
<td>• Provide ontologies defining vocabulary of multi-linguistic and cross-cultural context information</td>
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<tr>
<td>• Regulations to ensure that global laws and regulations are followed during electronic transactions</td>
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<tr>
<td>• Provide ontologies describing geopolitics guidelines</td>
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<td>• Develop mechanisms to manage relationships</td>
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Some notion of trustworthiness of a service and its service provider, before a particular service is selected to perform a specific task. Evaluating trustworthiness of available services is important, in order to avoid services that provide poor quality of services, create runtime exceptions, or behave erratically. Evaluation of trustworthiness of a Web service essentially means purging services who behave badly, giving low reputation for lower quality of services, and increasing reputation if service behaves correctly (Maximilien & Singh, 2004). Developing trustworthiness of Web services is still under researched and currently there are no well-developed means to evaluate trustworthiness of a service.

Trustworthiness of systems accessed over Internet infrastructure is influenced, in large part, by people’s prior experience in using that system (Schneider, 1999). Perceived usefulness and perceived ease of use would influence intention of the consumer to use an information system and also impact on the attitude of consumer towards usage of an information system (Pavlou & Chai, 2002). Experts on perceived trust by consumers argue that consumers spend too little on trustworthiness because of imperfect information (Schneider, 1999). As decision on trustworthiness obtained within the context of imperfect information, it creates a disincentive to invest for both consumers and producers, leading to a market failure. Therefore initiatives to mitigate this problem are highly critical for successful adoption of Web services technology. The absence of standardized metrics or a recognized organization to conduct assessments for trustworthiness is an important contributing factor to the imperfect information problem.

A trustworthy system is the one which users can completely rely on, fulfill requirements, and does not behave erratically (Banerjee, Mattmann,
Medvidovic, & Golubchik, 2005). Trust in most disciplines is studied at individual level and is measured as perceived probability of single unit less criteria (Msanjila & Afsarmanesh, 2006). In the context of Web services, trust is at organization level and is perceived probability of events within service and of the service provider; therefore, trustworthiness of a Web service should be measured as multi-dimension criteria. Trustworthiness of systems accessed over Internet infrastructure can be evaluated based on criteria such as software safety (when software failure would have severe consequences (Leveson, 1986)), availability of the system, reliability of the system, timeliness on responses, integrity of message delivery, survivability from security threat, and fault-tolerance (Voas & Ghosh, 2000; Wei, Zhongwei, & Zhitang, 2005). In context of Web services, there are security related standards such as WS-Security (WS-Security, 2006), WS-Trust (WS-Trust, 2007), WS-Federation (WS-Federation, 2008), and WS-Policy (WS-Policy, 2007); however, these standards address only security issues of Web service technology (Zhang, 2005). As described above, trustworthiness of a Web service includes issue beyond security such as safety, survivability, reputation, performance measure, availability, and fault-tolerance which are not addressed. Thus, in order to obtain favorable attitude from organizations to adopt Web service technology, there is need of well-developed framework to measure, monitor, and manage trustworthiness of services and its provider. Figure 5 provides summary of influence/impact analysis for trust factors on the adoption of Web service technology.

**Figure 5. Influence / impact framework analysis for trust factors**

<table>
<thead>
<tr>
<th>Influences of trust factors on the adoption of web services technology</th>
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<tbody>
<tr>
<td>• Perceived usefulness and ease of use of the service by the customer</td>
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<tr>
<td>• Need of customer reports for trustworthiness of services and providers</td>
</tr>
<tr>
<td>• Need for to make trustworthiness judgments on multi-dimension criteria which include issues beyond security</td>
</tr>
<tr>
<td>• Need for standardized metrics to assess trustworthiness on real-time basis</td>
</tr>
<tr>
<td>• Imperfect information about services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsequent impacts on the adoption of web services technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop mechanisms to measure, monitor, and manage trustworthiness of services and its provider</td>
</tr>
<tr>
<td>• Mitigate imperfect information related to trustworthiness of services to create favorable attitude from customers</td>
</tr>
<tr>
<td>• Develop multi-dimensional criteria that includes measures for safety, survivability, reputation, performance measure, availability, and fault-tolerance</td>
</tr>
<tr>
<td>• Develop standardized means to exchange secured and reliable messages among services</td>
</tr>
<tr>
<td>• Develop standardized means to measure quality of services</td>
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</table>
DISCUSSION

There is growing interest among researchers to use semantic and Web service technologies to interconnect people and machines; however, there is lack of understanding on influences of social dimensions and their subsequent impacts on these technologies. Understanding implications of societal factors are highly important before heavy investments of resources are made for developing and implementing these technologies. This chapter provides understanding on how societal factors are affecting adoption of Web service technology. Societal factors considered in this study are culture, social structures, geography, ethics, and trust.

Influence/impact framework analysis of these social factors revealed following common themes across factors: need of mechanisms to assess trustworthiness of services and its provider, need of mechanisms to manage relationships, need of mechanisms to enforce privacy and control access to confidential information, and need of mechanisms to support globalization management. Well-developed mechanisms for the above needs would create favorable conditions for organizations to adopt and conduct their business using Web service technology, thereby, increasing the rate at which Web services technology is adopted.

Culture in itself is not a fixed entity to explain what is happening, but conditions produced and used by the people in and out of activities (Liu & Westrup, 2003). Hofstede’s five cultural dimensions were considered as cultural factors for analysis on their implications on the adoption of Web service technology. However, Web service adoption could be cross-organizational and cross-national. Hofstede’s five dimensions are for categorizing national culture not for cross-national interactions; therefore other appropriate additional cultural factors such as situation culture should be considered for future work. Situation culture, contrasts views of culture as fixed and immutable, and instead suggests culture as a locally-based phenomenon grounded in the everyday practices and behaviors of particular groups of people in particular settings (Weisinger & Trauth, 2002).

Three modalities (signification, domination and legitimation) from Gidden’s theory of structuration were used as social structure factors for analysis on their implications on the adoption of Web service technology. One of the critique on Gidden’s theory is that it focuses on categorization of social structure, thus, offering only conceptual model for explaining reproduction of social structure but does not provide methodological approach to understand and reflect back into the world of practice (Rose, 1998). Rose and Scheepers (Rose & Scheepers, 2001) illustrates how the basic concepts of theory of structuration can be adapted by including a more familiar mode of practice (models, frameworks, vocabulary, and tools) to provide framework for understanding discourse style of information systems. Web service technology follows discourse style of information systems, because supporting communication among services is its core characteristic (Umapathy & Purao, 2007a). Therefore, framework provided by Rose and Scheepers for social practice should be considered for future work.

The reach of Internet is beyond geographical boundaries, which forces us to deal with different interpretations of ethics when using the Internet-based technologies (Gattiker, 2001). This chapter tries to answer the question “what are the ethical implications of creating and using Web services?”, but questions like “How can we ethically integrate Web services into society?” and “What are the specific social and ethical responsibilities of Web services developers?” are still unanswered.

Societal factors considered in this study are same for both Business-to-Business (B2B) and Business-to-Consumer (B2C) markets, but a study by Gibbs and et al. (Gibbs, Kraemer, & Dedrick, 2003) shows that B2B market seems to be driven by global forces whereas B2C market seems to be driven by local forces. Thus, appropriate global and national policies needs to be considered be-
fore adopting Web service technology in either markets.

One of the key factors for successful adoption of Web service technology would be creation of trusted environment for conducting business through Internet protocols. Trustworthiness is multi-dimensional concept; this chapter provides assessment from social dimension. However, necessary technologies have to be constructed that would help organizations to estimate and manage trust among business partners and their services in real-time basis. Such technologies would enable organization reap significant benefits when they adopt Web service technologies as they can use third party resources in a trusted environment.

In this chapter I have considered culture, social structure, ethics, region/ geography, and trust as social factors, and using influence/ impact framework I have shown how these factors influences and subsequently impacts on the adoption of Web service technology. In this section I have critically analyzed societal factors considered in this study and also indicated future direction for this study. In this chapter, I have considered only societal level of analysis, but the adoption of Web service technology would involve both societal and organizational level of analysis. Next ideal step would be to conduct similar study as a multiple level analysis, including both organizational and societal factors.

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The Influences and Impacts of Societal Factors on the Adoption of Web Services


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The Influences and Impacts of Societal Factors on the Adoption of Web Services


**KEY TERMS AND DEFINITIONS**

**Culture:** Is a collective mindset of members of a community that distinguishes from members of other communities.

**Ethics:** Is a normative value system that dictates whether a human action is right or wrong.

**Geography:** A large land area with particular geographic, political, or cultural characteristics that distinguishes it from other land areas.

**Globalization:** Can be characterized as exchanges such as capital, goods, ideologies, information, and technology among people across the globe.

**Social Structure:** Is the basis on which individuals perform their actions depending on associated rules and resources.

**Technology Adoption:** In organizational context, can be defined as commitment to invest towards implementing and using a technology to support core business functionalities.

**Trust:** Is willingness of a party to be vulnerable to unmonitored actions of another party.
Web Services: A software system that provides set of standards to support communication and coordination among services over a network, such as Internet, to achieve their goals.