

Cybersecurity: A New Framework for the Information Economy

Muhammad Tehsin

Assistant Professor, Department of Defence & Strategic Studies, Quaid-i-Azam University, Islamabad, Pakistan. Email: tehsin@qau.edu.pk

Abstract

The government's role as a digital platform brings with it challenges including the possibility that the freedom of expression and the right to privacy conflict with each other in the digital space. The citizen's privacy becomes exposed to new vulnerabilities. A citizen's voice, vote and changes in status, can be stolen or sabotaged with catastrophic individual and national consequences. Individual digital identity also must fall under digital property laws. One citizen's exercise of free speech can be trespassing of digital space for another citizen. The jurisdiction of the state in digital space must be redefined. The writ of the state in digital space must be more pervasive, and yet more narrowly defined, to protect the rights of all citizens.

Key Words:

Cybersecurity, Information
Technology, Service Sector,
Consumer, State

Introduction

The quality of all services is determined by the efficient flow of information. A service is initiated with a customer query (information inflow) and the service delivery is confirmed through a response to the customer (information outflow). A significant criterion for the quality-of-service provision is predictability. Demand is mostly sticky and follows a predictable gradient from historical sample paths. Therefore, the services are referenced by customers following a linear or non-linear predictable behaviour.

The services are designed and placed in an information architecture where customers can select from basic services (i.e., completely stripped-down entry-level options) to premium services (i.e., more advanced features). The principle of locality uses the architecture of services in a portfolio to assign proximity in terms of repeat demand for the same service specifications.

Information economy pertains to the role of information and communication technologies (ICT) in economic growth and social change. Information economy represents the structural shift in the global economy away from the primary (raw materials) and secondary (manufacturing) sectors of the economy. The structure of the modern service sector has been fatefully tied to the accumulation of wealth in fewer hands in the past three decades. This concentration of wealth has created social and political upheaval as an increasingly large number of people is left out by the service economy predicated on the prevailing service sector models. This paper investigates whether this wealth can be traced to present-day information characteristics in and around service architecture. This impact is seen in both the private and public sectors. Since all government functions can be easily defined as services the sheer speed at which the service sector is growing breeds the need for a new typology to explain emerging areas. The main research question that this paper seeks to address is: "How to provide cybersecurity to citizens on a digital governance platform?" The hypothesis of the study is: "Digital platforms are vulnerable to attacks, and legislative action is required to ensure citizen's digital rights."

Along with the main research question noted above, this study also delves into associated queries like, "What is Utility in the digital age? What is value creation? And what is governance and policy framework?" These associated queries further branch out in the form of the following supplementary questions:

1. How to protect citizen rights, including the right to vote, right of expression and right of assembly and political activity?
2. How to preserve individual privacy and property rights?
3. What is the common ground between state and individual in a digital age?

The modern service sector has evolved over the past century with a hopeful and inspirational message of democratization, empowerment, and shared resources. It is no coincidence that the pioneering lights of modern computing and the Internet were also members of the counter-culture movement (Kirk, 2002). They looked for means to replace the hierarchical structure through new means of information storage, retrieval, and transfer. Ironically, the rise of computing and technology has led to greater alienation of working people, and accumulation of wealth in the hands of the few, than ever before. The lofty aims of technology to replace repetitive tasks and enable the masses to think, create and innovate did not realize, leaving most of us underwhelmed by the recent strides in technology.

As we enter the third decade of the twenty-first century, this study takes a deeper look at operational risk, security/privacy, and the service-information architecture. In an age of cloud, machine intelligence, platforms, and multi-sided marketplaces, how does the mainstay of the service economy remain relevant in a digital information age?

The service economy is characterized by the flow of information through organizational boundaries. Services straddle the margins of Information and Organizational theories. To scope the structure of services, we shall

follow the state of Organizational and Informational theories, and list the forces shaping the future of the service sector.

The Changing Structure of Information Service Architecture

Ronald Coase (1937) presented an economic theory that explained and predicted the behaviour, structure, growth and boundaries of companies, corporations or firms, and their relationship to the market. The theory has been hugely influential in driving the mergers and acquisition decisions in recent decades. This present work contests whether this economic theory is still valid. Further, the current paper posits that the theory is no longer predictive of the next generation of services. Rather, the future of services must be based on approaches antithetical to the classical firm theory. Moreover, the theory of the firm is representative of the classical theories that must be reimagined and deconstructed to build a new organizational structure that works for all people, in a more representative, inclusive, and diverse economic structure. Online retailers like Amazon, and eBay; ride-sharing services such as Uber, and Lyft; and the emerging Cloud services segment, defies the fundamental premise of firm theory.

Oliver Williamson (1981) contended that the existence of firms is predicated on asset specificity. This means that the bargaining power of firms is determined by their unique ownership of assets needed by different agents. In most of the firms defined above, the assets are owned by a distributed group of owners, who are all equally able to provide the specific asset. The boundaries of the firm have been a limiting factor in all attempts to expand the influence, and more importantly, the firm’s capital. Within these boundaries, the value is produced and consumed by company badge-holders, as defined by the confines of a traditional firm. The enterprise segment, even up to present times, is limited by a need for supervision and corporate governance.

The requirements for full control and data governance are best defined by the Agency theory. Eisenhardt (1989) follows Agency theory as Information theory set between two players - the principle and agent - such that information is the main purchasable commodity. The agency problem refers to a condition where the desires of the principal and agent are in conflict, or when it is difficult for the principal to observe and validate the agent’s actions. The profession of journalism has recently been a laboratory for the principal-agent problem. The companies such as Facebook and Google have recently become media companies, acting as channels for the distribution of information, including news. This trend expanded to an extent that many citizens now cite Facebook as their primary source of news (David, 2019). The quality control role of the principal was previously held by newspaper and news channel editorial departments, who would avoid moral hazards through firm control. Further, there was specialized supervision over news bureaus and journalists operating as agents. However, Facebook and Google do not have editorial boards to verify news items. Moreover, with the proliferation of free agents, there is no way to monitor millions of news websites, blogs, and interest groups. In the 2016 election cycle in the US, most of the news shared and distributed in the trending hashtags was ignominiously termed “fake news” (Hunt and Gentzkow, 2017).

New Challenges for Cybersecurity

This is an example where the theory of the firm was challenged in the context of the news industry. News creation and distribution were expanded from the rarefied settings of editorial boards into thousands and tens of thousands of web pages, each with almost no oversight. The case of the 2016 US elections leads to disastrous consequences. In and of itself, a possibly progressive idea can lead to such negative effects for the largest segment of the community. There remains a looming challenge for the future of technology, namely, how to include communities as participants in the process of value-creation, while avoiding the perils of moral hazard in the principal-agent problem? How to include the greatest number of people in the process of service delivery, while upholding the ideal of the greater good?

The moral hazard faced by Facebook is the peculiar version of the principal-agent problem. The emerging service sector is defined less by expertise lying within the boundaries of the firm and relies more on the collective intelligence of the market. In the instance of Facebook, both the Principal (i.e., Facebook) and the market (i.e., the discerning public) have obviously proven themselves to be inadequate at measuring and maintaining the quality of service (i.e., truthful news). The challenges faced by all technology companies revolve around the following four areas:

- a) **Privacy:** Personal Identifiable Information (PII), which could be used to trace an individual, must be always secured. The question that arises here is: Do the rights to privacy (i.e., US Constitution Fourth Amendment rights) apply to one’s data in the Cloud?
- b) **Security:** Breaches to data integrity are prevented through predictive systems.
- c) **Human Rights:** Right to express oneself in all public and private settings (i.e., US Constitution First Amendment rights).
- d) **Moral Hazard:** In the principal-agent problem, the need for systems to evaluate the agent’s conduct.

Table 1. Cloud Services

User Base	Industry Verticals	Software Services (SaaS)	Platform Services (PaaS)	Infrastructure Services (IaaS)
Enterprise	Hospitality	Application (Power Apps, App)	Security and Management Services	VMs

Governments	Health Care	Engine) Workflow Platform (O365, CRM, Team)	Reporting and Monitoring	Containers
User Groups	Finance	AI platform	Policy and Orchestration	Hosts
Small Businesses	Energy	Communication Platform	Capacity Planning	Cache Delivery
Startups	Manufacturing	Search Platform	Business Analytics	Networking
Sharing Economy	Retail	Collaboration Platform	Reporting and Visualization	Virtual Networking
Aggregator Markets	Media/Content/Communication	City Platforms	Auditing	Storage and Database solutions
				Security, Access, and Identity

Table 1 depicts the model of the current technology stack powering the information economy from community to infrastructure. Presently, large Cloud providers such as Microsoft, Amazon and Google are providing the infrastructure services e.g., compute, storage, and network. These companies currently provide platform services e.g., reporting, security, policy, and analysis. Further, the Cloud providers also create SaaS frameworks e.g., machine learning, search, communication, and application as a platform. All these layers are moving through rapid commoditization, moving the entire stack to the right. In the next wave, the aggregation and multi-side markets will hold a competitive advantage. This would form the centre of the greatest innovation required for product differentiation in any market. This work studies the classical information service theory models and evaluates the models in light of current growth in new service structures.

Main Features of Proposed Framework

The typologies of service address the control and power approach, classifying systems based on the control system and participant kind of involvement (Etzioni, 1961). The degree of power and control exercised on the customer by the service system has been used as the factor separating organizations (Van Riper, 1966). Early separation of service operation into ‘equipment based’ and ‘people-based’ services (Thomas, 1978) becomes fuzzy. Most services are an interplay of people and equipment, with the people part, being largely played by the customer. However, the work does not extend to the classification of services because of the factor of control. Power parity and duration of information service are used to classify services (Mills and Margulies, 1980) using dimensions of information processing. However, it does not connect the taxonomy to the nature of demand or supply, and the method of service delivery.

Chase and Tansik (1983) use the contact dimension to classify firms. This model also takes into account the duration of contact but does not consider the frequency of contact. However, Chase and Tansik are one of the earlier works that define the conditions of low contact services. The distinction of “for the customer” versus “to the customer” cannot hold when the customer is the co-creator of value in the Service System (SS).

Complexity is defined as the number and intricacy of the steps required to perform the steps. Divergence is the degree of freedom allowed or inherent in the process step (Shostack 1987). The concept of engineering services is extended in the current paper.

The argument put forth in this paper is a natural extension of Lovelock’s (1985) and Shostack’s (1987) work. Lovelock’s idea of an emerging new field and function is extended in the current work by expressing how service and information architecture drift over time. The framework of slicing service functions into pre-transaction, transaction, and post-transaction services, is further explored with prediction services. The present work considers service provision as a process of co-creation of value, independent of who initiates the service. User involvement in the provision of service enables the system to have an infinite capacity, mitigating the issue of matching supply with demand in the service industry (Sasser, 1976). Each new customer becomes a source of extending the capacity of the SS, under the constraints of infrastructure deployment. It is in no way suggested that the customer is a partner in service innovation (Magnusson, Matthing et al., 2003). However, it is implied by Magnusson et al. that given the right architecture and choice hierarchy, customers can tap into the collective wisdom of the crowd to engender innovation. The prediction and nudge service feedback loop does not fall into a feedback fallacy (Baumol, 1986), and is equally applicable to handicraft services and computer-based activities. The antecedents and consequences of emotions (Pugh, 2001) are neutralized in sinecure services, by making the customer the only human in the interaction. A customer ‘zone of tolerance is a function of expectations and perception (Liljander and Strandvik, 1993). It is a fact understood that humans have a greater capacity to be patient with their own selves in comparison to any external agency.

The research in information service science has oscillated between the points of view of the service provider to that of the customer. The major dimension of service taxonomy in the above-mentioned research papers has been the characteristics of the system/customer interface and the attributes of the service process (Wemmerlov, 1990).

The paradigm shift lies in how we classify services and measure their success. If individual service offerings are considered profit-centres, then the revenue per offering goes down by using the sinecure service model. However, if the services are seen as a portfolio occupying the infinite extension of the tail, the collective revenue of the tail in most organizations outweighs the peak performers. Another example to exhibit the difference between the two service

provision models is Wikipedia versus Encyclopedia Britannica (EB). EB is a classic example where articles are selected because of either broad-based relevance to several interest groups or a popular readership (i.e., high demand). Encyclopedia Britannica offers 120,000 articles written and edited by experts in the field. The reader cannot make any changes to the articles. Any criticism needs to be submitted to the editorial board, which reserves the right to accept the criticism or even respond to it. On the other hand, Wikipedia is open source with articles being submitted by ordinary readers. Anyone can edit the articles and make changes however the market forces decide who has the final word on a controversial topic. Wikipedia has 5.3 million articles online from the very popular, and well written, to the obscure and poorly drafted entries. The 75,000 contributors make additions and provide editing services in 100 languages to allow for the long tail demand for articles. These Wikipedia articles are about issues that at times only a handful of people care about and therefore, otherwise would not find a place in Encyclopedia Britannica.

There is a need to find a happy balance between Encyclopedia Britannica and Wikipedia, as one cannot replace the other. Neither of them can serve all the needs of society. The challenge is how to introduce the arbitrage boards in a Wikipedia model. This should be such that the longstanding and well-known benefits of Encyclopedia Britannica are restored while including the crowdsourcing benefits of Wikipedia.

Conclusion

Governments are rapidly turning into digital platforms. These digital platforms must provide all the functions of traditional governments, and then some. It is critical that citizen rights do not fall through the cracks of this emerging state function. The citizen's identity becomes paramount in the digital world. Secure immutable identity is the bedrock of a trustworthy digital platform. A digital platform is where citizens can exercise their rights, fulfil their responsibilities, and access benefits through a series of connected portals, applications, and workflows weaved together through a single sign-on (SSO) authentication framework.

This paper has presented a model of the emerging information architecture with classical organization structure to see how the disruption in information systems will change and evolve the future of organizations, value, and productivity. It is emphasized in the current paper that the customers need systems that default to optimism about them, rather than building on the premise that machines can be trusted with better judgement. It is further posited in the paper that technology must be utilized to help customers make better decisions instead of taking the decisions away from them. The aim of technology is to make full use of human skills and insights as full and holistic specimens of shared humanity.

References

- Allcott, H., & Gentzkow, M. (2017). "Social Media and Fake News in the 2016 Election." *Journal of Economic Perspectives*, 31(2), 211-236. DOI: 10.1257/jep.31.2.211
- Baumol, W. J. (1986). "Information Technology and the Service Sector: A Feedback Process?" (1986) in Faulhaber, Gerald, Noam, Eli, and R. Tasley, Eds. *Services in Transition: The Impact of Information Technology on the Service Sector*. pp. 183-199. Cambridge, MA: Ballinger Publishing Co.
- Chase, R. B., & Tansik, D. A. (1983). "The Customer Contact Model for Organization Design." *Management Science* 29(4), 1037-1050
- Coase, R. H. (1937). "The Nature of the Firm". *Economica*. 4(16), 386-405
- David, C. C., Pascual, M. R. S., & Torres, M. E. S. (2019). "Reliance on Facebook for news and its influence on political engagement." *PloS one*, 14(3), e0212263. <https://doi.org/10.1371/journal.pone.0212263>
- Eisenhardt, & Kathleen, M. (1989). "Agency Theory: An Assessment and Review," *The Academy of Management Review* 14(1), 57-74.
- Etzioni, A. (1961). "A comparative Analysis of Complex Organizations: On Power, Involvement, and Their Correlates." New York: Free Press of Glencoe. 379-381.
- Kirk, & Andrew, (2002). "Machines of Loving Grace: Alternative Technology, Environment and the Counterculture," in Braunstein, Peter and Doyle, Michael William, Eds. *Imagine Nation: The American Counterculture of the 1960's and 1970's*. 373-374. New York: Routledge.
- Liljander, V., & Strandvik, T. (1993). "Estimating Zones of Tolerance in Perceived Service Quality and Perceived Service Value", *International Journal of Service Industry Management*, 4(2) 6-28. <https://doi.org/10.1108/09564239310037909>
- Lovelock, C. H. (1985). "Developing and Managing the Customer-Service Function in the Service Sector." in Czepiel, John A., Solomon, Michael R., and Carol F. Surprenant, Eds. *The Service Encounter: Managing Employee/Customer Interaction in Service Businesses.* pp. 265-280. Lexington, Mass.: Lexington Books.
- Magnusson, P. R., Matthing, J., & Kristensson, P. (2003). "Managing User Involvement in Service Innovation: Experiments with Innovating End Users," *Journal of Service Research, JSR* 6(2), 111-124
- Mills, P. K., & Margulies, N. (1980). "Towards a Core Typology of Service Organizations." *Academy of Management Review* 5(2), 255-265.
- Pugh, S. D. (2001). "Service with a Smile: Emotional Contagion in the Service Encounter." *The Academy of Management Journal* 44(5), 1018-1027.
- Sasser, W. E. (1976). "Match Supply and Demand in Service Industries." *Harvard Business Review* 54(6), 133-140.
- Shostack, G. L. (1987). "Service Positioning Through Structural Change." *Journal of Marketing* 51(1), 34-43.
- Thomas, D. R. E. (1978). "Strategy is Different in Service Businesses," *Harvard Business Review* 56(4), 158-165.
- Van Riper, P. P. (1966). "Organizations: Basic issues and a proposed typology." in R. V. Bowers, Ed., *Studies on Behavior in Organizations: A Research Symposium*. Athens: University of Georgia Press.
- Wemmerlov, U. (1990). "A Taxonomy for Service Processes and Its Implications for System Design." *International Journal of Service Industry Management* 1(3), 20-40.
- Williamson, O. E. (1981). "The Economics of Organization: The Transaction Cost Approach," *American Journal of Sociology* 87(3), 548-577.