# Internet of Things (IoT) in Business Strategies : An Exemplary Framework

*Devarshi Chatterjee*

*Student, Indian Institute of Management Ahmedabad, India*

*Vastrapur, Ahmedabad, 380015, India*

*deva.chat123@gmail.com; 9748362579 (M)*

*and*

*Prof (Dr) Devapriya Chatterjee (Corresponding Author)*

*Ex-Director (MBA), Shankara Group of Institutions Jaipur,*

*Management Consultant and Chartered Engineer (India)*

*BB-73, Salt Lake City, Kolkata-700064, India*

*drdpchatterjee@gmail.com; 9123999144(M)*

*Abstract*

*The paper brings to light the several strategies, used by businesses, utilizing the Internet of Things (IoT). As we are aware, the Internet of Things (IoT) is a distributed network of physical objects, that are connected to each other. The Internet of Things (IoT) devices do not use any intermediary, but make the exchange of data with each other. and in this fashion, the complexity of the business environment is increased manifold, opening up the opportunities of new business. In the event of the owner of the platform having an open source technology, and never owning the data, different users could build and use on the same platform. The research brings to light a framework with a few additional strategies, that remain dependent on the integration of the offerings of the business into the contribution of the Internet of Things (IoT) environment, or into one of the value-chains of the industry, taking into consideration, the nature of offering of the business, whether systematic or stand-alone. The identified strategies of the businesses, are taken into consideration, for*

*bringing to light the new framework. New opportunities that make a significant impact on the management of the strategies and boundaries of the organizations, emanate from digitalization. As the businesses evolve from technological verticals and clusters of propriety towards new open environment, a study is necessary for the employing of innovative strategies for the new open business environments. The decrease of cost of cloud computing as well as advanced technology, resulting from the complex offerings of service, driven by augmented expectations of the customers, is the net result of the transformation caused by the digitalization.*

*Keywords : strategies, Internet of Things (IoT), framework, digitalization and transformation*

## Introduction

The best strategy in a digitalized business continued to be a platform, that increased due to indirect as well as direct effects of network, and the attraction of diverse participants. The core of the technology was provided by the owner of the platform and the corresponding participants could utilize the same for the delivery of their services and products. The corresponding participants utilized the platform for making access to the end users, that evolved a multi-faceted market of the consumers. The platform owners reap huge profits through the intermediates of the participants of the environment, but the processes of the environments of the businesses, that are driven by platforms remained unclear. The connectivity between the participants, is augmented by the Internet of Things (IoT) through physical objects that make the exchange of information in a distributed network. It is observed that that the resultant system of the Internet of Things (IoT) evolves an adaptive and complex system. Further, there is significant difference from the structure of the centralized network, that surrounds the platforms. The benefits of the platforms comprising of the transactions and interactions, do not become obsolete, due to the decentralization of the data availability, arising from the systems of the Internet of Things (IoT). The emerging environment of business, that is driven by the Internet of Things (IoT), enable the functioning of the diverse strategies. In order to take advantage of the new and emerging environment, the variability of the Internet of Things (IoT) is needed to be charted, and the relevant strategic alternatives need to be

segmented. The research studies this area of the Internet of Things (IoT), and augments the comprehension of the strategies that fit into the environments of the Internet of Things (IoT).

The paper observes that the businesses could adopt four standard strategies in the matter of the Internet of Things (IoT). A platform in the system of service is relevant strategically, but the paper proposes three auxiliary strategies, that are supplementor, fabricator, and system coordinator. These auxiliary strategies enable the businesses to adopt a positive function in the business environment of the Internet of Things (IoT). The paper designs a framework for the strategies that bring to light the functionality of the two dimensions, namely, the integration level and the offering of focus. The dimension of the integration level judges if the business could integrate in specific chains of industrial values or could be utilized in any condition. The dimension also monitors the drift of the businesses from chains of industrial values towards the environment. The dimension of the offering of the focus brings to light the fixation of the business in the environment of the business. The systematic focus highlights the creation of coupled knowledge; and the outbound or inbound process of knowledge, is the stand-alone offering in the business environment.

**Objectives of the Study**

The objective of the study is to contribute to the decision of an innovative framework for competitive advantage with digitization implanted in the products, make apparent discussion on the management firms in the environment of Internet of Things (IoT), and make the preliminary work for the emerging environment of the strategies of Internet of Things (IoT).

**Methodology**

We need to remember that the environment of business, driven by the Internet of Things (IoT) is completely different from the environment of business, driven by the technology of platforms. We need to establish a theoretical base by combining the environment of the digital platforms and the Internet of Things (IoT).

a) An Environment of Business driven by the Technology of Platforms

In this type of environment, the technology of platforms is a specific segment of the environment,

that comprises of the owner of the platform, along with the supplementors and end- users. The development of the environment of the technology of the platforms, depend on the external features of the networks. The end-user normally makes the offering of the conglomerates of systems values, that are built together with the supplementor and the intermediates of every end-user in time as well as place. The control of the core elements of technology, and the making of access to the same, along with the development of the business driven by the technology of platforms, is determined by the owner of the platforms. The influential businesses in the environment are the owners of the platforms They define the interfaces and the standards, that are shared by the businesses, that are interdependent, and make in a collective fashion, the offerings for the entire gamut of the customers. The function of the supplementors is to connect the offerings to the platforms with the union of the interfaces and the technologies, that are controlled by the owners of the platforms. The processes adopted by this type of environment of business, are not very clear, but it is certain that these evolve with two standard mechanisms, namely, the open mechanism and closed platform mechanism. In the open mechanism, the interfaces are open for any participant, supplementor or end-user and offerings could be made without any approval of the owner. In the closed platform mechanism, the access to the networks, applications and systems are restricted by the owner.

b) An Environment of Business driven by the Internet of Things (IoT)

This technology facilitates the models of distributed network, that question the logic, that is prevalent, and bring about more context specific frameworks and strategies. The environment of the Internet of Things (IoT), is related to all devices, that are physical and virtual in nature, and have the ability to receive and send information in real time. The data of the environment of the Internet of Things (IoT), erects the virtual parallel counterpart of reality, used for prediction, safety, optimization and control. The key point that distinguishes the environment of business of the Internet of Things (IoT), from the environment of business, driven by digital platforms, depends on the specifications of core elements. The environment of business, driven by digital platforms, normally revolves round the core of the protected technology. In the environment of

business, driven by the Internet of Things (IoT), the core is more complex in nature. The architectures of the system are normally based on the technical core elements. Further, the processes are not visible to the users.

The connectivity and the extended core elements, driven by the Internet of Things (IoT), cause the transformation of relationships as well as the interrelationships towards distributed arrangement with two different mechanisms. Firstly, the devices of the Internet of Things (IoT) could act on own as segments of systems, and remain implanted in the control logic, that remains programmed into the devices for setting regulations and transmitting information. Due to the distributed setup of the communicating devices, the connectivity is augmented beyond the network prescribed by the owner of the platforms. Secondly, the devices of the Internet of Things (IoT) augment the bondage between the several systems of service, that jointly set up a system of systems. This system of systems comprises of complex sub systems for the accomplishment of targets, even when delinked from the remaining system of systems. Thus we find that the system of systems is never under the dominance of any participant, and exhibits qualities, that are similar to complex adaptive systems, like adaptation, individual specialization, progressive development, synergy and developing behavior. The environment of business driven by the technology of platforms is mechanistic and proprietary, where the owners of the platforms enjoy the positions of agents and legitimizing the advantage of authority of the data and technology. However, the environment of business driven by the Internet of Things (IoT) makes the environment of business better distributed and connected, that causes the positions of agency harder to be occupied, and complexity to be more augmented. The observation convinces that the strategies, that are specific to the Internet of Things (IoT), need further deployment, whereas the analysis on the environment of business driven by the technology of the platforms is grossly insufficient.

c) The Proposed Framework for the Internet of Things (IoT) Strategy

We are aware that we need to accommodate that context of the Internet of Things (IoT), where businesses transact their services and products to other businesses as well as the customers. The

proposed framework has chosen two dimensions as the basis of operations. These are, the type of integrations of the business with the environment or value chain; and the type of offering of the business of either the theory supported open innovation or stand-alone type. The integration of the type of value-chain indicates that the business is either participating in a value chain of a particular type or controlling the same. The businesses that are integrated to the environment are participating in the environment. The integration of the business to a particular value chain requires a kind of customization, where the integration to the environment demands interfaces that are open for the service or product. The bifurcation could be compared to the split of specialists with generalists, in the subject of population ecology. In this case, there is requirement of both the roles, as both the roles have their positions in the environment. The collection of the business environments comprise the knowledge of the body, that creates the participants as well as the value chains, that reside outside the environment. This further implies that both types of businesses, that make both the strategies as feasible alternatives, are supported by the environment. The dimension of the stand-alone type of offering indicates how the systems are implanted in the environment. It has been established from the open innovation types, that the businesses engage in the environment with three processes of knowledge, namely, a) moving outside-inside, b) moving inside-outside, and c) remaining coupled. The first two processes allow the businesses to benefit from suppressing the external knowledge or manifesting the interior knowledge. The process of the coupled knowledge causes the initiation of the sharing of knowledge with others, by simultaneous suppression and manifestation of knowledge, that benefits all the participants. This highlights the businesses with reference to the environment.

The business is either initiator, causing systemic offering, or could be stand-alone type, causing the offering of business-specific services and products. The solutions that are systemic in nature, normally cause an increment in the value added by the provider of service. However, these systems also need an arranger of resources that are networked. The downside of the less control of the environment, projects the feasibility of the strategies of stand-alone offerings.

d) Data

The primary sources of data for the research paper were the websites of the businesses. The challenges faced with the collection of data from websites were met by the downloading of the contents of the webpages for the analyses of the researches (retrieved between June 2024 and August 2024). The primary focus was made on the contents that were available on the home page and the pages that described the direction of the businesses, along with the history, as well as the mission of the businesses. In each case, contents from three pages were set aside for analyses. For additional data source, video-conference was made with the owners of the businesses, recording their version of the direction of their own businesses. Further, the document that were related to projects were utilized and the functions of these materials were to augment the understanding and enlighten the researchers to form an outline picture of these businesses. As far the analyses of the data were concerned, firstly, the sources of the data were read for an overall understanding of the businesses. Secondly, the contents were coded for studying the strategic orientations of the businesses towards the Internet of Things (IoT), and the understanding of the business of the Internet of Things (IoT). Thirdly, the researchers made an analysis of the individual businesses with the positioning of the Internet of Things (IoT), and highlighting the types of strategic orientation.

**Findings and Discussion**
The analyses of the businesses, brought to light that the businesses are developing on the opportunities that are developing from the environment of the Internet of Things (IoT). The research had developed three strategies for offering the environment of the Internet of Things (IoT).

In a Supplementor strategy, service intensive products are sold through systems of other businesses, that are specific to a certain usage of the products, either a value chain or a standard. In this strategy, the control of the business over the system is restricted. The business is passive to all requirements and changes, rather than being active. The supplementors are normally on

contracts with the owners of the platforms, and are unable to make direct application of one solution to another matter. This model makes profits from the rendering of services that are professional in nature, that is a result of the tailoring of the Supplementors, and the maintenance of the solution through services and in the service system. The owners of the platforms enable the Supplementors to make use of the peripheral network, and could make access to the new markets as well as the constellations of services. In this process, the risk is very low, with standardized products, that are developed in the interfaces of the platforms, without any visibility of the systems of the owners. This strategy is beneficial for small-scale businesses, but could be scaled, if open interfaces are applied. The research indicated that this type of strategy is most suitable for offering stand-alone products for ventilation, and also make profits by rendering services, that are related to the product. This strategy offers specialization at a higher level, and businesses that utilize this strategy, provide products or services that are customized, and make profits by connecting the service systems to the products.

In a Fabricator strategy, solutions are provided by businesses, that are not only consistent, but could also be integrated to systems of service through stand-alone interfaces, and diverse types of technology platforms. The Fabricator has little or no control over the arrangement of the service system. This strategy is mostly used for making software for augmenting the speed of connectivity between devices and then integrated into a software product or a device. The main target of this business product is the collection of the royalties from the sales of service or end product. The construction of these business models is based on scale economies, and hence the life-cycles of the products are very limited. The businesses normally operate in open environments, and there is transactional relationship with the platform owners. The benefits of this strategy include mass customization and flexibility. The stand-alone solutions of this strategy could be consolidated into any environment, that suitably extends the lifetime of the product.

The System Coordinator strategy defines the standards of the interface and also controls the connections of the diverse technology platforms, in the Application Programming Interface (API)

level. In this strategy, the businesses collaborate with each other, and make joint offerings, that are well arranged. The System Coordinator receives the rent from the owners of the businesses and reap benefits of the opportunities and peripheral networks. The business models that utilize this strategy are non-profit and pay rent to the System Coordinator for professional services and the education of the participants for the usage of the open standards. The emerging environment and the participants gain from the chances provided by the emerging innovation. In this strategy, there is a common platform, for all businesses to perform, and make the performance simpler, by collaboration of boundaries and rules for participants.

The objective of the paper was to spell out the strategies of a business in a business environment of the Internet of Things (IoT). The analyses of the collected data indicated, firstly, that the researchers made a thorough examination of the contents provided by the businesses in their websites, for projecting their orientations of strategy. Secondly, these businesses were positioned in the framework of strategy designed by this research. The environment of the Internet of Things (IoT) supplied increased connectivity, along with data and processes as key elements.

The business environment of the Internet of Things (IoT) is similar to these systems, that are complex and adaptive in nature, and permit more different strategies, along with the owning of the technology platform. The proposed framework of the research , separates out the businesses, with their type of combination, to the focus of systematic offering versus standalones, and their value chains. The analyses of the data indicate that the businesses began developing specific strategies of the Internet of Things (IoT), that are different from the strategies of the controlling products. There were instances of certain businesses pursuing the long established product logic, but there were also businesses that progressed to particular offerings for the business environment of the Internet of Things (IoT), and exploited through the augmented connectivity, the developing opportunities in the market. It is needed to understand the limitations as well as the characteristics and terms of every strategy, and that would augment the consciousness, for every selected strategy, the paths of evolution and opportune time.

**Major Contributions of the Study**

The major contribution of the study is made to the management research of the evolving environment of the Internet of Things (IoT), by the integration of service science, platforms of technology and theories of systems. It is observed that though there is high relevance in the industry, and the growth is very quick, the research of the Internet of Things (IoT) business is still in nascent stage. We find that this is the first study that makes an approach to the strategies of the businesses, from the point of view of the Internet of Things (IoT). The paper, firstly, predicts the future changes, that would be induced by the Internet of Things (IoT), in the environment of the business fundamentals. This helps to make the forecast and build the future environments of business, as systems of complex adaptive nature, while charting the diverse strategies to be adopted, by the participants of the networks. The paper, secondly, provides the framework for the categorization of the strategies of the businesses, in the environment of the Internet of Things (IoT).

The research framework, along with its results are found to support the theory that the complex offerings and technology, are not being able to be developed by businesses, that indicate the requirement for coupled knowledge processes. It is implied by the framework that the only viable strategy is based on standalone processes, and in the business environment, the businesses could play the roles of the Fabricator or the Supplementor.

**Managerial Implication**

We are aware that the increased competition in the environment of business, is mostly due to the environment of platforms. The paper confirms that the businesses need to be able to sustain and establish their presence for capturing value from the environment of businesses driven by the Internet of Things (IoT). The roles of the businesses as Supplementors, Fabricators and System

Coordinators, evolve in the course of time, and the businesses are never initiated in these roles. With the increase of connectivity, along with data and processes as core elements, along with improved technology, the management of the complexity would exhibit considerable value, that benefits the end users, due to the increased specialization of technology. It is observed that the proposed framework in the paper could be utilized for strategization of digital business, though it is in the context of the Internet of Things (IoT).

The proposed framework is beneficial for the planners for the evaluation of the roles played by the organizations, in the environment of the Internet of Things (IoT), when the framework is treated as a regulating tool. Furthermore, it is implied by the framework, that the roles could be changed by the firms in course of time, and that all roles are valuable. Besides, the businesses could also engage in diverse roles simultaneously. We are also aware that there is quick growth in the environment of the Internet of Things (IoT), and the same may have negative or positive impact on the society. It is therefore necessary to monitor closely the roles played by the different participants, and in what ways. It is therefore observed that the proposed framework in the paper could be utilized for creating the environments of the Internet of Things (IoT), for public services, as well as private-public partnerships.

**Further Scope of Research and Limitation**

The research has limitations in the sense that it was unclear if the businesses outside the area of the study could be classified under the recommended framework. The study assumed that the businesses had more or less same orientations in the environment of the Internet of Things (IoT), and as such, fitted in the standard framework. Furthermore, the area of the study included only well-funded businesses.

The future scope of research indicates the study of the change of the strategies of the businesses, as the predicted new technologies augment the connectivity, and cause the businesses to make changes in the strategic directions, with the improvement of the new technologies. Furthermore, conducting video-conferencing, augments the reliability of the results of the study,

and enhances the knowledge of the dynamics of the strategies of the Internet of things (IoT), assisting the making of a longitudinal study.

## Conclusion

The paper scrutinized the different strategies, adopted by the businesses driven by the environment of the Internet of Things (IoT). The recommended framework eliminates complexity and brings to light the standard strategies. The standard strategies make easy the planning of the model of the business and specify the applicable types of synchronization. The results highlight that the recommended framework is most useful for the planning purposes of the policies of the corporates, and the roles are understood by every participant of the business environment, that provide them the competitive advantage in the market.

## Acknowledgement

## References

1. Barabasi, A. L., *Linked the New Science of Networks,* Perseus Publishing, Cambridge (MA), 2002

2. Burt, R. S., *The Social Structures of Competition,* Harvard University Press, Cambridge (MA), 1992

3. Ceccagnoli, M., and C. Forman, "Co-creation of Value in a Platform Ecosystem : The Case of Enterprise Software", *MIS Quarterly 36*(1), 2012, pp. 263-290

4. Cusumano, M., "Technology Strategy and Management : The Evolution of Platform Thinking", *Communications of the ACM 53*(1), 2010, pp.32

5. Dahlander, L., and Gann, D. M., "How Open is Innovation?", *Research Policy 39*(6), 2020, pp. 699-709

6. Davies, A., "Moving Base into High-Value Integrated Solutions : a Value Stream Approach",

*Industrial & Corporate Change 13*(5), 2004, pp.520-527

7. Eisenhardt, K. M., and Graebner, M. E., "Theory Building from Cases : Opportunities and Challenges", *Academy of Management Journal 50*(1), 2007, pp.25-32

8. Fenton, C., and Langley, A., "Strategy as Practice and Narrative Turn", *Organization Studies 32*(9), 2011, pp. 1171-1196

9. Freeman, J., and Hannan, M. T., "Niche Width and the Dynamics of Organization Populations", *American Journal of Sociology 88*(6), 1983, pp. 1116

10. Gassman, O., Enkel, E., and Chesbrough, H., "The Future of Open Innovation", *R & D Management 40,* 2010, pp. 213-221

11. Gatignon, H., and Xuereb, J. M., "Strategic Orientation of the Firm and New Product Performance", *Journal of Marketing Research 34*(February),1997, pp. 77-90

12. Gawer, A., "Bridging Different Perspectives on Technological Platforms : Toward an Integrative Framework", *Research Policy 43*, 2014, pp. 1239-1249

13. Hagiu, A., and Wright, J., "Multi-Sided Platforms", *International Journal of Industrial Organization 43*, 2015, pp. 162-174

14. Karcanias, N., and Hessami, A. G., "Complexity and the Notion of the System of Systems, Parts (1 & 2)", *World Automation Congress (WAC), 2010(1i),* 2010, pp. 1-7

15. Katz, M. L., and Shapiro, C., "Systems Competition and Network Effects", *Journal of Economic Perspectives 8*(2), 1994, pp. 93-115

16. Li, S., Da Xu, L., and Zhao, S., "The Internet of Things : a Survey", *Information Systems Frontiers 17*(2), 2015, pp. 243-259

17. Maglio, P. P., and Spohrer, J., "Fundamentals of Service Science", *Journal of the Academy of Marketing Science 36*(1), 2008, pp. 18-20

18. Normann, R., and Ramirez, R., "From Value Chain to Value Constellation : Designing Interactive Strategy", *Harvard Business Review 71*(4), 1993, pp.39-51

19. Teece, D. J., "Business Ecosystem", *The Palgrave Encyclopedia of Strategic Management,* 2014

20. Wu, Q., Ding, G., Xu, Y., et al., "Cognitive Internet of Things : A New Paradigm Beyond Connection", *IEEE Internet of Things Journal 1*(2), 2014, pp. 129-143