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SWIMAC: Enhanced SMAC Architecture for Business Solutions in Digitalization of IT Infrastructure Services

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Abstract: Redefinition of the Business Trends in the IT Infrastructure Solutions industry took place in the last few years with the incorporation of SMAC stack as the major constituent of the major IT Business Model that led to Digitalization of the IT Business Solutions. The SMAC architecture is quite good but it lacks two major aspects namely the Semantics of the Web and Web Optimizations and the usage of Internet of Things (IOT) as its primary technology. A new technology stack SWIMAC for enhancing the IT business trends is proposed and analyzed. The Technology-Impact Distribution of the constituent technologies in the SWIMAC architecture is studied. Also a survey is conducted for the technologies in SWIMAC and the results are studied. Finally empirical justifications for SWIMAC as a separate architecture is put forth for incorporation of Web Semantics and IOT in the SWIMAC architecture.

Keywords: Digitalization, Social media, Semantic Web, IOT, Mobility, Analytics, Cloud Computing, Business Trends, SMAC, SWIMAC, Intelligent Agents.

I. INTRODUCTION

The current age in which technology business is based is the information age where useful information becomes knowledge and knowledge in turn transforms into a billion dollar stake. With the clients' requirements changing in day to day business in the World of Technology, a proper mechanism must be followed in order to cater to the changing perspectives across business. Also the IT Infrastructure must adopt new architectural changes in order to adapt to the changing needs of the clients. Focus on a change in the vantage point of the technology will enhance the productivity and standardization in the perspective of the Business.

There was an evolution from the Hardware to the Software Age to the Information age in the past three decades; there is a huge shift in the paradigm in which the business strategy has evolved in the recent few decades. Several Knowledge representation systems and Artificially Intelligent Information Systems have been developed in the recent past in order to cater to the business development and improvise the age old prototype of the business delivery model. A business delivery model must be focused and studied because it creates a great impact in the way technological aspects are incorporated to a specific business. The rendering of the business must be highly feasible to the organization and must satisfy the goal of the business outcome. Much more is that the clients must benefit from the business of the Organization.

With several technologies available in the market, there is no proper organization of all these technologies into a proper technological architecture which would be functional. The recent advancements in the technologies in the recent times with respect to Information Processing and Rendering are Cloud Computing, Big Data and Analytics, Social Networking, Smart phone technology, Artificial Intelligence, Semantic Web and Internet of Things(IOT). The absence of improper structuring and organization of the available technologies to model it into a specific class or category makes it more needful to have a properly defined technological architecture to drive business. There is a need for amalgamation and usage of all these technologies to achieve a proper outcome of success with reference to a larger perspective of Business Life cycle.

Motivation: Several technologies to drive the Infrastructure IT business exist but they are more randomized and are not constituted into a model or architecture. This makes them more random and distributed. There is a need for redefining the business model of IT Infrastructure Services and in turn optimize the usage of available technological resources for the organizations to enhance the process of business operations. Although a technological stack for Social, Mobile, Analytics and Cloud (SMAC) exists, there are a few missing technologies which would in turn make the business more achievable and meaningful. The need for engineering and defining a new overall architecture for the most recent advances in Information Systems and Management for elevating the functional model of the IT organizations exists.

Contribution: A study of the recent advances in technologies in the field of Information Systems Management and Information processing is carried out. An empirical evaluation is carried out based on a survey of which technologies are contributing to the most

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appropriate business strategy. A proper architecture and technological stack is built for the technologies which influence and improvise the business paradigm at a large scale. A functional architecture prototype for Smart Phone Technology, Social Networking Platforms, Analytics, Cloud Computing Technology, Internet of Things (IOT), Semantic Web and AI is built.

Organization: The organization of this paper is as follows. The Section II provides a brief overview of related work. In Section III the Proposed Architecture is presented. The survey results and analysis is discussed in the section 4. Section 5 presents SWIMAC as the sixth wave in the IT Digital business. Section VI focuses on the Emperical Justifications. Conclusions and future work is presented in the Section VII.

II. RELATED WORK

Malcolm Frank [1] has proposed the underlying concept of SMAC and how the SMAC stack will drive the IT business to the next level. He proposed the SMAC Technological Stack and has equated SMAC as a self-driving business model that would have a high impact in the Business World.

M. Sarkar et al., [2] have studied the inclusion of SMAC in the IT Business. They have analysed the SMAC technology and its usefulness but have also proposed their concern of security in SMAC stack and discussed means to overcome and fix them.

KPMG CII [3] has cracked the SMAC code and has described SMAC as the new underlying technology for creating a new business revolution. This document gives a classical meaning of SMAC architecture and also predicts the future of enterprises who have embraced the SMAC as their business model.

Kevin S Parikh [4] has highlighted the SMAC architecture and has related it to revolutionizing the customers' needs. He emphasizes on the Business Value of the SMAC stack in creating an impact to the Business Services and henceforth in turn influences the clients to whom services have been rendered.

III.PROPOSED ARCHITECTURE

The layered SWIMAC architecture is loosely coupled whose components are arranged in a coherent, structured and layered fashion to constitute the proper modelling of the Information Technology oriented business. The major focus of proposing the SWIMAC architecture is to integrate the other mandatory technological additions such as IOT, Knowledge and Web Intelligence to drive the business to another elevated level in the Information Technology Infrastructure oriented business ventures with the underlying SMAC architecture [1] that is currently creating an impact to power the IT business in various broader spectrums.

Digitalization of business processes is the major objective of the already available SMAC architecture [1] whereas SWIMAC focuses on digitalization with optimization of digital delivery of the IT infrastructure services.

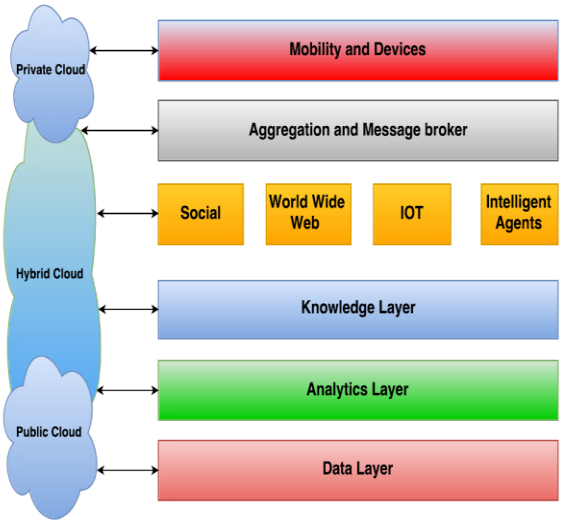

Figure 1: Layered SWIMAC Architecture

SWIMAC bridges the pragmatic gap between IT infrastructure services and the IT technologies that are available to accomplish those services.

The lowermost layer of the SWIMAC layered architecture is the Data layer. The data layer is actually integrated with several operational databases which record the day to day transactions. The next immediate layer above the data layer is the Analytics Layer. The Analytics layer is highly important as the Data Analysis takes place in this layer. Data Analysis could vary from simple OLAP (Online Analytic Processing) analysis to high end big Data Analytics. Analytics is quite important in the business perspective because, several predictions of business can be inferred and can be formulated for improvement in order to improve on the perspective of business. Data Analytics Transforms the Data into Information which in turn becomes Knowledge which is highly useful in improvising the business trends. The Layer above the Analytics Layer is the Knowledge Layer which gathers high end useful knowledge and is represented in Knowledge Bases and is interpreted with Semantic Meanings in order to cater to the needs of several business and technological users. The Knowledge Representations with respective to several target applications takes place in this layer.

The immediate stack above the Knowledge Layer is a loosely coupled technology set that include Social, World Wide Web, IOT and Intelligent Agents. These technologies form the centralized hub from where IT services can be delivered to the end users, naïve users and clients.

Socialrefers to the Social Networking Platforms commonly referred to as social media that are available for Collaboration. Collaborative Projects enhances the ability of outsourcing and gives a better distinction to enhance the quality of outcome. Social Networking Websites and Applications provide a faster and a cheaper mode of communication which can also be used for business perspectives. Digital Marketing, Targeted Online Marketing, Viral Marketing and other modes of online advertising has become one of the latest trends and the

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key modes of marketing in the era of Digital Society.

World Wide Web not only refers to the web component involved in the SWIM-AC architectures but it refers to enhancing the semantic look and feel of the web and optimizing web searches such that Web is easier to access and also becomes a much safer place for work. It also includes other Application Integration over the Web to enhance web commerce to facilitate a higher growth in the digital business front. The web component is a unique feature of the SWIMAC Architecture which is explicitly absent in the SMAC Architecture. Although SMAC boasts of including web in the cloud, there is a huge difference between the Web Technologies and the Cloud Computing Strategy. Though Cloud can be visualized as a part of the Web, one cannot say that Web optimizations would fit into the technological additions of Cloud Computing.

IOT (Internet of Things) component focuses on allowing several real life things to be connected to each other by means of the internet such that monitoring and controlling becomes quite easy. Though the term IOT has just debuted into the research industry in the last few years, the ideology of connecting two or more systems has existed since the Internet era. However controlling capability from a distance and automating tasks via the Internet has given rise to a brand new terminology the IOT which forms the heart of the SWIMAC architecture. The presence of IOT in the SWIMAC architecture gives a clear cut demarcation that it is quite privileged than the mere SMAC architecture in the Digital front of IT Business.

Intelligent Agents component refers to those artificially intelligent autonomous independent software programs with a specific functionality directed towards a certain objective. Agents mostly are software programs which serve the underlying software applications or the users' using the application by contributing their functionality. Agent Technology has enhanced the Software Technology as agents are incorporated whenever there is a need to serve and boost the quality of the software's functionality by attributing to their functionality.

The ultimate layer of the SWIMAC architecture is the Mobility and Devices Layer. Mobility refers to the strategy wherein the applications can be accessed from anywhere anytime and can either be controlled automatically or can be controlled through human intervention from a distance by either partial supervision or full supervision. The mobility layer comprises several devices or things which are used in day-to-day life. It could range from Mobile Phones, Laptops, Television, Microwave, Refrigerator, Wi-Fi-Port, Cars, Clocks, Washing Machines, Air Conditioners, Electric Bulbs, etc. It could also include remote systems, servers, routers, Data centres, etc. These devices enable the connectivity of the things with the internet to promote IOT and automations. The penultimate (the last but one) layer is the Aggregation and Message broker which serves as an intermediately layer between SWIMAC components and the Mobility and devices layer. It facilitates the integration of the mobility devices with the SWIMAC components specifically through IOT.

IV. SURVEY RESULTS AND ANALYSIS

From the literature survey conducted and the survey based on reading several blogs hosted on the web, it is clearly evident that the Digital revolution has started and is the future of the IT Services and Infrastructure is the Digitalization of Business Services. Also a survey which involved several software professionals, Research Scholars and Senior Researchers, Business Professionals, Technical Architects and Scientists revealed that Digitalization is the current trend that is totally ruling the IT services sector in Business Delivery. Digitalization as of now uses SMAC as its underlying architecture [1].

The role of SMAC [1] is to accelerate the Business in IT Infrastructure Services but SMAC is deficient of much useful technologies such as IOT, Semantics of Web, Web Optimizations and Agent Technologies which forms a part and parcel of the IT infrastructure business. This is well defined in the SWIMAC architecture. According to the survey and predictive analysis IOT will take over the market and will be at the top in probably the next few years and henceforth mandating it in the architectural design of Digitalized Business in the IT front is commendable. The SWIMAC architecture can be described as "Supreme Digital" real world IT Business Architecture.

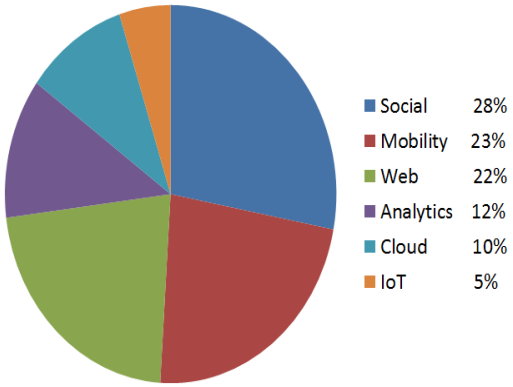

Figure 2: Survey results of Technologies in SWIMAC

The survey results of the technologies that are involved in SWIMAC Architecture is depicted in Figure 2 where the survey participants state that Social Networking Platforms have a 28% contribution for enhancing the IT business solutions through collaboration and permanent connectivity and Mobility contributes its role of 23% for accelerating the business outcome owing to its anywhere anytime access of application through mobile devices.

The survey statistics also reveal that Web Technologies like Semantic Web, Web Search Optimizations have a 22% contributing in driving the IT business as the Web is the storehouse of a large amount of data that needs to be organized in order to make the responsiveness of the web higher and its look and feel must be brought to a higher level. Analytics is a key constituent of improving Business Intelligence and it has 12% significance in enhancing the business according to the survey. Cloud and IOT play 10% and 5 % role in improving the IT Infrastructure Business

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Solutions. The results are purely based on the survey which involved professionals from several domains of the Information Technology Business. The survey is an opinion of what these professionals think about the technologies that are influencing the IT business at the present time.

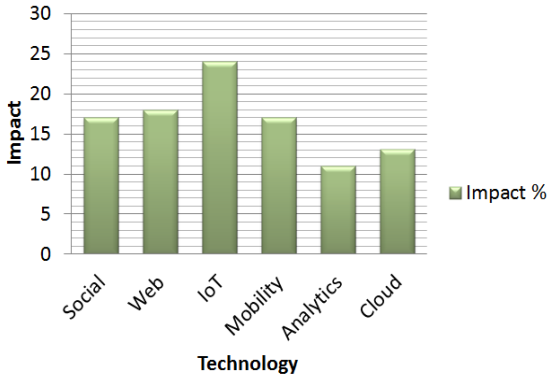

Figure 3: Technology-Impact Distribution

The graph in the Figure 3 depicts the technology Impact Distribution of the technologies involved in SWIMAC in the next five years. The graph is a result of Survey and Predictive Analysis which states that IOT will lead all the technologies and would have an impact of 2% in improvising business trends and strategies. The reason behind this could probably be that IOT enables connectivity between several devices and things, improves automation and enhances remote monitoring making it one of the Supreme Technologies in the SWIMAC Business Model. The Web and Social Networking Technologies would have an impact of 17% and 18% respectively. There is only a difference of 1% in between these parameters as Web Optimizations would accommodate the Social Nature of the SWIMAC quite easily. Mobility would have an impact of 17% and would make the business availability very high as Mobility makes the computing more distributed where the applications can be accessed from anywhere and anytime. Analytics would have an impact of 11% and Cloud Computing would create an impact of 13%. However, the Technology-Impact Distribution Analysis reveals that all the constituent technologies in the SWIMAC technology stack would create a huge impact in providing the IT oriented business solutions. Contrary to the SMAC architecture, where only four predominant technologies are involved, the SWIMAC architecture provides feasibility and accounts for the inclusion of two principal technologies namely IOT and Web Optimization and Semantic Technologies.

V. SWIMAC: SIXTH WAVE IN THE IT DIGITAL BUSINESS

The Figure 4 depicts the Trends in Computing over the years and it's an enhancement of the 5 waves in the IT Digital Business [1]. It's highly ecstatic to know that there is an exponential rise in the Business with the newer computing trends over the years which portray the IT Business getting better and growing over the years.

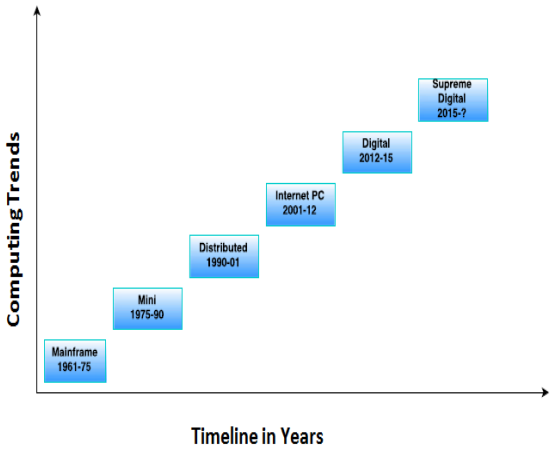

Figure 4: Computing Trends over the years

The figure also gives a realization that the IT industry has come a long way from the Mainframe Technology where improvising Computing power was the main concern to Supreme Digital where the Outcome of the Business is the major concern. The Supreme Digital Technological Stack which follows the SWIMAC architecture is proposed to be the next major impact in influencing the IT Business Structure just because it adds on two major areas of Infrastructures in Computing namely the IOT(Internet of things) and the Web Optimizations and Semantics onto the existing SMAC technology stack. The graph in the Figure 4 predicts that the Supreme Digital Technology would overtake the existing Digital Technology in turn increasing the business trends in the near future.

VI. EMPERICAL JUSTIFICATIONS

Q1: Should Web be a separate parameter in the SWIMAC Architecture.

Web is a larger entity than Cloud. There is a need for continuous Web Search Optimizations and technologies to improvise the Semantics of the Web. Web is a repository of large amount of information and there is a need for structuring and organization of the information. The technologies to improve the Semantics of the Web must be accommodated in the Digital technology stack. The need for Web Optimizations would take digitalization to the next level. Cloud can be a part of Web (at least the accessing of the Cloud servers needs Web) but the inverse is not possible as Web is a larger and a bigger entity than the Cloud.

Q2: Why should Social Networking Websites be separately included in the architecture? Why social media can't be merged with the Web Component of SWIMAC as Social Media is visualized as a Website.

Social distinctly stood as a standalone component in the SMAC architecture [1]. Social media may be a website but Web component in the SWIMAC architecture does not refer merely to websites though websites may be a part of it. It includes an array of technologies that optimize web searches and makes the web look semantically better. Web also includes technologies to cite and index web pages in order to make the Web a better place to be. Social Media

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has redefined digitalization and has contributed a lot for social activity and improved business. Henceforth, Social component should be a separate component in the SWIMAC architecture.

Q3: IOT is a relatively new technology. Why should IOT be included in the SWIMAC architecture?

IOT (Internet of things) though relatively new is not treated as a debutant as it has enormously large number of advantages in remote computing. IOT is visualized as connecting anything on this planet with the internet and enhance their functioning by a remote monitoring. Also automation of the things based on the internet connectivity is the major objective of IOT. From the Technology-Impact Distribution in figure 3, we can infer that IOT stands the highest impact that evaluates to 24% of the Technology Impact. This evidently proves that IOT should not be a standalone budding technology but rightfully it has a place in the SWIMAC technological stack for enhancing the strategic business trends of the IT industry.

Q4: Will Supreme Digital overtake Digital IT? Justify.

Digital IT is based on the simple SMAC stack which is a boom today but Supreme Digital is an enhancement of SMAC where there are more technologies like Web Semantics and IOT is added. IOT is the next new generation technology everyone will look forward to. This is clearly evident from the Technology-Impact Analysis in the figure 3. Henceforth, with more efficient technologies in SWIMAC stack, the overall intelligence of Supreme Digital is higher than Digital IT. It is quite natural for Supreme Digital Technology to overtake Digital IT.

VII. CONCLUSIONS AND FUTURE WORK

The need for a new architecture for Supreme Digital Business is evaluated. The SWIMAC architecture is proposed for enhancing business capabilities of IT Infrastructure Business Solutions and creates more stability for taking the business into a newer level. Analysis of the individual components of the SWIMAC architecture and their contribution in improving the technology is depicted.

A survey for technological components in the SWIMAC architecture is conducted and the survey results are analysed quantitatively considering their need in improvement of business trends. A technological-impact distribution evaluation is conducted for the constituent components in the SWIMAC architecture. The concept of "Supreme Digital" or "Supreme Digitalization" is proposed as the next generation technology in Computation and IT Business. Finally the Empirical Justifications are carried out for the need for IOT and Web Semantics as separate technologies in the SWIMAC architectural stack.

The most appropriate future enhancement for this work could be the incorporation of Security awareness into the SWIMAC architecture. Also, a comparison literature for SMAC and SWIMAC can be conducted and depict the most efficient one. Apart from these discussed enhancements, a business prototype comprising the SWIMAC architecture can be implemented. Also e-commerce can be related to SWIMAC architecture and several case studies can be birthed as a future enhancement for this proposed paper. Detailed Analytics architecture and its stages can be proposed as a future work.

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