The Enterprise Management Business Box Model: A SaaS Based Platform for SMEs

Mr. Roshan Chandekar[1], Mr. Bhuwaneshwar Dhawale[2], Ms. Prerna Rewatkar[3], Ms. Priti Pal[4], Ms. Aachal Zanjal[5]

[1]*Professor,*

[2]*Student,*

[3]*Student,*

[4]*Student,*

[5]*Student*

Tulsiramji Gaikwad Patil collage of engineering and technology, Nagpur

Abstract: *Cloud computing, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) are terms that denote new developments in the software industry that are completely changing the way software is produced, consumed, and distributed. In particular new PaaS business models have a disruptive effect on existing business models and require thorough business model innovation in the software industry. Despite their impact, PaaS business models have not been considered in a sufficient manner in literature yet. The paper at hand contributes to this gap by providing an overview of typical characteristics of PaaS based on a systematic literature review, a classification model of existing PaaS business models based on case studies, and an overview of the current state and future development directions of PaaS.*

Keywords: Platform as a service, business models, cloud computing

1. INTRODUCTION

Communication Platform as Service (CPaaS) empowers developers to add voice, SMS, Email and What's App to their applications effortlessly without requiring them to build and maintain a real-time communication stack. CPaaS is a cloud-based platform that provides a complete development framework for adding real-time communication/messaging features to applications, which in traditional scenario use to get developed as part of the applications. With ease of use and flexible pay as you use pricing, enterprises are increasingly adopting CPaaS as a model for adding real-time communications to their applications. According to Statista, CPaaS is expected to grow to at least $17.2 billion by 2023. Cloud computing and its components, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS), are terms that denote new developments in the software industry that are completely changing the way software is produced, consumed, and distributed. Infrastructure such as computing resources and storage are bundled, shared, and provided as a service. Previously highly protected software platforms were opened and are further developed in emerging ecosystems of independent, third-party developers and platform owners. Functionality of software is consumed over the browser. Consumers do not buy licenses of software products anymore, but pay for its usage on a pay-per-use basis. Due to all these changes, information technology is transforming into a general-purpose technology that can provide a fundamental contribution that promotes growth and competition and is opening new opportunities

for users as well as producers of computing technology and software (Etro 2009). These developments have a disruptive influence on business models of existing players in the software and hardware industry.

The changing way of producing, consuming, and distributing software requires innovative, effective business models from new players and thorough business model innovation of existing players in the software industry (Chesbrough 2007; Johnson et al. 2008). Major changes to business models in the software industry are imposed, in particular, through the trend toward software platforms. In general, platforms can be defined as ―a set of subsystems and interfaces that form a common structure from which a stream of related products can be developed and produced efficiently‖ (Halman et al. 2003). Business models based on the platform paradigm are at least two-sided or even multi-sided business models and require a flourishing ecosystem or community of external contributors. PaaS business models are just emerging in the software industry.

Small and Medium Enterprises (SMEs) are playing a key contribution to a healthy economic environment. Traditional Enterprise Resource Planning (ERP) systems are generally too expensive for SMEs. Fortunately for technological enhancements, cloud computing makes it possible for companies to rent ERP on a subscription or a pay-per-use model. Due to cash flow, capital and human resource constraints, the public cloud is an ideal solution for SMEs. The business application as well as the server infrastructure is owned and maintained by cloud service providers. Previous studies have found that by losing direct control over systems is one of the main disadvantages of Software-as-a-Service (SaaS-based) ERP.

By adopting SaaS-based ERP, organisations fear that they will lose control over the security and privacy of their data making their systems vulnerable to data breaches. In addition, loss of control over system performance and uptime might also cause rejection of SaaS. The purpose of this qualitative research study is to explore the adoption of SaaS-based ERP by SMEs in an emerging economy like South Africa, when not only control, but also trust is placed in the hands of third-party providers to manage, protect and support the heart of a business, i.e. its mission critical business system. An analysis is required of the adopter categorisation where local SMEs currently find themselves in and an understanding of SMEs willingness to outsource their IT, data and business software.

This study has found that on the basis of Roger's diffusion of innovations (DOI) theory, if any of the SME participants would want to adopt a SaaS application, they would fall in the "late majority" adoption category. With 53% of the business applications used in this research study is of a SaaS type, it can be said that the peak of the innovativeness curve has been reached for SMEs partaking in this study. Overall, it has been found that SaaS-based ERP performed better than conventional ERP by achieving a 32% higher ranking in functionality and a 27% higher ranking in provider support.

While planned downtime outside business hours has no effect on the adoption of SaaS-based ERP by SMEs in this study, planned downtime within office hours, unplanned downtime and severe cloud outages does have an effect. Most SMEs wouldn't reject SaaS-based ERP; they would rather prefer to switch cloud providers.

It turns out that most SMEs in this study are risk averse and will reject a system previously hacked. It has been found that a major security breach would have an impact on SaaS-based ERP adoption. Such an event would cause most participants to switch to an alternative provider; half of which would migrate back to an on-premise ERP application

FEATURES:

Easy Integration: Enterprises can use a comprehensive test, and run environment to integrate and manage the rich communication features in their applications.

Flexible Pricing: Enterprises are charged for the API as per their usage without requiring to add any infrastructure.

2. LITERATURE SURVEY

From a qualitative literature analysis, in line with Levy and Ellis (2006), vom Brocke et al. (2009), and Webster and Watson (2002), two main research findings have been deduced: first, a basic definition for platforms in general and software platforms in particular were derived, and second, the major characteristics of PaaS offerings were identified.

Pursuant to vom Brocke et al. (2009), the first step of the performed literature analysis comprised the definition of the review scope. We defined the focus on research outcomes in order to summarize scholarly literature as well as to integrate our findings. It is hoped that the expected results are of some value for researchers interested in the economics of information systems, as well as practitioners. Once the scope of the analysis was defined, working definitions of the key terms were provided and are introduced in the background section. Step three of the five proposed steps by vom Brocke et al. (2009) involves the actual literature search that begins with identification of relevant journals and databases. Consentient with Levy and Ellis (2006), we identified Business & Information Systems Engineering, Communications of the ACM, International Journal of Business Information Systems, IEEE Transactions and Computer, and the Journal of the Association for Information Systems as relevant. In addition, five prominent databases, ACM Digital Library, IEEE Xplore, AIS Electronic Library (AISeL), Springerlink, and ScienceDirect, were targeted. These five databases cover almost all the identified relevant journals and most of the top-ten IS conferences, according to Levy and Ellis (2006) and WKWI (2008). Thus, these databases were considered comprehensive enough to gain a set of literature that represents the current status of IS research literature. The resulting working definition of PaaS and their main characteristics are introduced in the following section.

Explorative Case Studies The main research effort was dedicated to explorative case studies, which investigate the business models of existing PaaS providers. An explorative case study approach was chosen because of its ability to investigate problems that need to be examined in their real-world context, due to their complexity and interdependencies (Cavaye 1996; Eisenhardt 1989; Yin 1981, 2003). With the use of case study research, the goal to describe and to structure the complex business models of today's PaaS providers was pursued.

Yin distinguishes four basic types of case studies based on the number of cases (single-case vs. multi-case) and the number of investigated units of analysis within a case (a unitary unit vs. multiple units of analysis) (2003). In the context of the research presented in this paper, multiple case studies were used, as they allow the replication of results, the analysis of patterns between the cases, and a better generalization. A selection of suitable PaaS providers was conducted based on the characteristics of PaaS offerings derived as a result of the preceding qualitative literature analysis.

Each case study of a multiple-case design can either focus on the same unit of investigation or multiple logically delimitable units (Yin 2003). Since the aim of our research is the investigation of business models of PaaS providers, we focused on multiple units, which together define the business models of PaaS providers. For each case, the approach suggested by Osterwalder and Pigneur (2010) was adopted as a common research framework. The analysis framework and structure applied is described in detail in the subsequent section, Business Model Analysis.

Classification Scheme In order to provide an overview of the current state, a classification scheme for PaaS providers business models was developed, based on the classification methodology introduced by Fettke and Loos (2003). According to Fettke and Loos (2003), a classification scheme is ―a set of characteristics, which

are suitable to classify objects of a specific application domain.‖ The five phases of the proposed classification methodology were applied as follows:
(1) Inception: The aim is the development of a classification scheme for business models of PaaS providers. The resulting classification scheme should provide a comprehensive, but abstract survey.
(2) Elaborate categories: The concept of analyzing within-case data as well as searching for cross-case patterns were applied to elaborate categories based on the data collected (Eisenhardt 1989; Smith 1990; Yin 1981, 2003). ―This process allows the unique patterns of each case to emerge before investigators push to generalize patterns across cases‖ (Eisenhardt 1989). In the course of the cross-case pattern search, two tactics were applied: First, the business model building blocks introduced by Osterwalder and Pigneur (2010) were used as categories in order to look for within-group similarities and intergroup differences. Second, pairs of cases were selected and similarities and differences between cases were listed in order to identify new categories.
(3) Specify classification scheme: The identified categories of PaaS providers business models were structured by using a morphological matrix according to Zwicky (1969).
(4) Test: The developed classification scheme was iteratively tested and improved by classing a total sample of twenty-five PaaS providers; classing means providers were assigned to classes that have been previously defined (Bailey 1994; Marradi 1990).
(5) Use and maintenance: The resulting characteristic-based classification schema was used to analyze the twenty-five investigated PaaS providers and to shape hypotheses regarding future directions for PaaS providers.

3. METHODOLOGY

BACKGROUND: Platforms as a Service Cloud computing and especially PaaS are terms that denote a new computing paradigm in the IT industry and that are completely changing the way software is produced, consumed, and distributed. In order to build the research on a rigorous foundation, the terms cloud computing and PaaS are subsequently introduced and recent developments are illustrated.
A considerable amount of literature has been published on cloud computing. However, up to this point there is no clear or even standardized and, therefore, generally accepted definition of cloud computing. As a result, in the following, two common definitions are presented. One of the most cited and well-established, but quite general, definitions is the one provided by the National Institute of Standards and Technology (NIST): ―Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction‖ (Mell and Grance 2011).
The definition of Vaquero et al. (2009) is taking into account the most elementary aspects of the concept and will serve as a basis for the paper at hand: ―Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms, and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the infrastructure provider by means of customized SLAs‖ (Vaquero et al. 2009).
According to the most cited architectural concepts for clouds and cloud computing, PaaS are an important part of cloud computing architecture; PaaS are the middle layer connecting the IaaS and the SaaS layer of clouds The IaaS layer offers

computing resources such as processing, storage, networks, and other fundamental computing resources that can be obtained as a service (Mell and Grance 2011; Stanoevska-Slabeva and Wozniak 2009). The SaaS layer is the most visible service of cloud computing, due to the fact that the software applications are accessed directly by the end-users (Stanoevska-Slabeva and Wozniak 2009). These applications are deployed and executed in cloud systems and can be accessed from various client devices through a thin client interface such as a Web browser (Mell and Grance 2011). The PaaS layer, connecting the IaaS and the SaaS layer, will be discussed in detail in the following.

Platforms in general can be defined as ―a set of subsystems and interfaces that form a common structure from which a stream of related products can be developed and produced efficiently‖ (Halman et al. 2003). In analogy to this general definition, platforms in the software industry are referred to as ―... a hardware configuration, an operating system, a software framework or any other common entity on which a number of associated components or services run‖ (Poel et al. 2007). While the general definition provides a broad selection of what a platform in the software industry might be, the exact definition of PaaS is still open to debate.

While the definitions are quite heterogeneous, several common features can be identified: PaaS is a Web-based development platform which is opened toward external developers and can be used by them to develop components that can run on it.

3.1 BUSINESS MODEL ANALYSIS

According to Johnson et al. (2008), ―One secret to maintaining a thriving business is recognizing when it needs a fundamental change.‖ Further prior studies that have noted the importance of analyzing business models are Chesbrough (2007), Drucker (1994), Morris (2009), and Osterwalder et al. (2005).

Based on an analysis of definitions for business models in literature, the definition of Osterwalder et al. (2005) was taken as a basis for the research presented in this paper. According to them, ―A business model is a conceptual tool containing a set of objects, concepts, and their relationships with the objective to express the business logic of a specific firm. Therefore, we must consider which concepts and relationships allow a simplified description and representation of what value is provided to customers, how this is done and what are their according financial consequences.‖ The same authors propose a so-called business model canvas for analyzing business models. The canvas is comprised of a predefined structure along with business model components. According to Osterwalder et al. (2005) and Osterwalder and Pigneur (2010), a business model consists of the following nine building blocks: Value Proposition, Customer Segment, Customer Relationship, Distribution Channel, Revenue Stream, Key Resources, Key Partners, Key Activities, and Cost Structure. While the first five components describe how the business model appears on the market and is experienced by customers, the remaining four components represent rather the internal view of the business model, i.e., how it is implemented by a specific company. Given the fact that the focus of the analysis presented in this paper is on the customer and market perspective of the business model and not on how it is implemented in the specific company, the analysis focused on the market-view components proposed by Osterwalder et al. (2005) and Osterwalder and Pigneur (2010). This also allowed for concentrating the analysis of the existing PaaS providers' business models on secondary data, i.e., data that is available online or through other available documentation and provides detailed information for the market view of the business models. Information about the internal view of the business model (i.e., key resources, partners, and activities, as well as cost structure, which in most of the cases is kept confidential) is difficult to

obtain. Thus, the analysis was based on a subset of business model components presenting the market view of it.

4. RESULTS AND DISCUSSION

The main goal of the research presented in this paper was to investigate the current state and future directions of PaaS providers business model in order to illustrate the evolution of this new way of developing and selling software. Based on a systematic qualitative literature review, first the main characteristics constituting a PaaS were identified. These characteristics are (1) Openness toward external developers, (2) a programming environment, (3) test and simulation facilities, (4) automated resource management, (5) application hosting, (6) administration and management tools, and (7) knowledge management support. Furthermore, explorative case studies were performed, which investigated the business models of existing PaaS providers by using the business model canvas proposed by Osterwalder et al. (2005) and Osterwalder and Pigneur (2010).Based on the data collected, a classification schema for PaaS provider models was developed. Hence, one of the main research outcomes of this paper is a classification schema for business models of PaaS providers, which is illustrated by using a morphological box. The classification model distinguishes four categories: (1) Customer segments, (2) Core value proposition, (3) Revenue streams, and (4) Technical value proposition. Another main result is the identification of three core types of current PaaS providers based on their value proposition: (1) development focused platforms, (2) application-based platforms, and (3) distribution-channel-focused platforms. Depending on their type, platforms undergo a different evolution and future development path. Finally, the findings of the various analysis performed, were used as a basis for the assessment of potential future developments of PaaS. Two phases of future developments have been identified: (1) short-term development toward platform-based two-sided business models, and (2) midterm development toward platform wars. The above results provide significant practical and scientific contributions. The identification of the main characteristics of PaaS solutions, as well as the embedding in the overall cloud computing concept, contribute scientifically to the understanding of the PaaS phenomena and its importance as a core component of cloud solutions in the future. Even more, taking into consideration that the three types of PaaS cover a substantial number of currently available cloud solutions prevailing on the market, it can be concluded that transformation of such single cloud offerings as SaaS or IaaS or online services toward platforms and inclusion of PaaS is becoming a dominant design in the cloud area. From the practical point of view, the list of features defines must-have features of current and future PaaS and cloud platforms, which are necessary to assure the competitiveness of PaaS providers.

The results of the case studies, the classification schema, and the typology of business models also contribute to the understanding of the PaaS business model phenomena from the scientific and practical point of view. While there are many attempts in literature to classify business models in general and in particular, there are seldom classification schemas and typologies that are grounded in a systematic classification approach. This paper contributes to theory, on the one hand, by demonstrating how classification methodology can be applied to classify PaaS business models and, on the other hand, with the specific PaaS classification result. The easy-to-understand and-use classification schema can be applied by practitioners to visualize their business models and compare them with the features of their competitors. With this approach, similarities and differences among business models can be detected and visualized. The identification of the three types of PaaS business models also can help practitioners identify their type of business

models and use the knowledge provided to optimize their current market position and develop future development strategies.
The future development directions were identified based on the case studies and by relating the discovered business models to the rich management and strategy literature dedicated to platform-based n-sided business model. This allows, on the one side, to tap into existing knowledge related to possible strategies and outcomes of platform-based n-sided business models. On the other side, clouds and PaaS are new cases where theory and research findings about platform-based n-sided business models can be applied and verified. The identification of the future directions and characterization of the market into ―winner take all‖ and ―winner takes most‖ market is helpful for PaaS providers and investors in this area. PaaS providers can identify the market they are active in and develop well-informed strategies based on scientific findings. Finally, by using the well-established canvas of Osterwalder to analyze the business models, this paper contributes to the verification of the canvass model and provides suggestions for the improvement of the canvass methodology for analysis of n-sided business models.

5. CONCLUSION AND FUTURE RESEARCH

The main goal of the research presented in this paper was to investigate the current state and future directions of PaaS providers' business model. Based on a comprehensive methodology-mix, this paper provides results with significant scientific and practical contribution. The theoretical and practical contributions may serve as a starting point for decision makers' business model innovation plans.

Major practical and scientific results are the list of PaaS features, the classification schema for PaaS business models, the typology of PaaS platforms, and the identified future development trends. From a business model and technical prospective, these results can be a starting point for a design theory for PaaS. The development of a design theory for platforms and business models of PaaS and cloud offerings might be one future research question. Furthermore, given the fact that PaaS are just entering the platform war stage, longitude analysis of the transformation processes in terms of features of the technical platforms and business models can provide input to the design theory but also to the knowledge related to platform-based n-sided business models in general. Thus, a longitude analysis of selected key PaaS players representing different markets segments can be another future research direction.

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