e-Platform Architecture for Organisational Collaboration and IT Education

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A B S T R A C T :

The paper defines the architecture for an e-Platform for organisational collaboration and IT education along with the business model to implement the approach outlined here for human capital development and management in a complex environment of national and international IT organisations. The research suggests that a digital platform for organisational collaboration and management of IT competencies could be the solution to the issues in IT training and to help organisations that are experiencing difficulties in the selection, development, employment and sustaining of key IT experts.

Introduction

In the past couple of years, an epidemic rise of ePlatforms has been observed on the Internet. Platforms have been generically defined by Sangeet Choudary as "business models that allow multiple sides (producers and consumers) to interact by providing an infrastructure that connects them."[1] On the other hand, John Hagel gives a more strict definition about platforms and states that they need to have a "governance structure," rules that "determine who can participate, what roles they might play, how they might interact and how disputes get resolved" and

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"an additional set of protocols or standards to facilitate connection, coordination, and collaboration."[2]

Platforms became a key instrument to expand a firm's market and fulfil our social expectations for services. According to Simone Cicero, "the idea of modern services revolves around four major traits." Services have to be: a) fast – instantly searchable, identifiable and accessible, b) personalized – enabling us to directly intervene in creating custom solutions, perfect for our needs, c) relevant – fulfilling our needs contextually when they occur, in a relevant and precise manner without needing our intervention and d) humanized – relating with us in a friendly, interpretable, understandable, accessible, sensible manner, interacting with us as human beings.[3]

Besides the sudden increase of ePlatforms, the IT education and training underwent a massive transformation in the past decade. On the one hand, as a result of the enormous use of information and communication technologies in all industry sectors such as government, defence, healthcare, banking, businesses, commerce and education, which led to increased demand for qualified IT personnel. On the other hand, "despite the increasing availability of ICT, many countries are unable to utilise this potential to the full, often because they lack the know-how needed to create an enabling environment for the development of a local IT sector with private sector engagement or because they lack the skills and expertise to apply these technologies appropriately."[4]

The practice of achieving an IT degree in a traditional, old-fashioned way is protracted and involves a number of areas that need to be improved. Due to the fast-changing market demands for IT personnel and the slow-paced university educational programs, even outdated curricula, a market gap for IT staff has been identified by companies which are struggling to maintain a sustainable IT expertise within the organisation.

Before the digital era revolution, IT education was a classroom-based instructor-led learning. Due to the pressure applied by companies in search of skilled IT personnel the IT education market evolved into putting forward of a number of online platforms that offer IT training to organisations and end users, numerous IT educational products, and online qualifications and certifications programs.

Nevertheless, finding knowledgeable IT employees remains difficult today. The continuous development of the industry sectors and the increasing demand for ICT products, will contribute further to the shortage of competent IT workers. Statistics in 2018 show that 68 percent of recruitment professionals reported problems when filling positions up compared to 50 percent in 2013.[5] Another drawback is the lack of complete collaboration and close partnerships between the different players involved in the recruitment, governance, education and employment of IT staff.

This research paper suggests that a digital platform for organisational collaboration and management of IT competencies could be the solution to the issues in IT training and the organisations are experiencing in the selection, development, employment and sustaining of key IT experts. A collaborative ePlatform offering

close partnerships between leading national/international educational bodies representing schools, colleges, universities and research institutes, employers, governmental organisations and businesses, students and IT professionals. The platform should be developed, in order to enable the creation of knowledgeable IT people cluster, "one-stop-shop for IT staff resources" to facilitate, organise and initiate access to knowledge, innovation, market, talent, and capital.

e-Platform Business Model

A recent real-life example of a new online education initiative is that of Harvard Business School that launched HBX in 2014. The usual understanding of online learning experience was a leaned back individual learning experience where a student would watch video lessons at their own pace. HBX designed a new online platform with an active student experience. Their platform focuses on social learning by solving real-world business problems, in order to help the students understand the applicability of concepts in real business solutions, In addition, HBX made a revolution by encouraging active learning by asking the student to interact during the lessons every 3-5 minutes at most. Another big advantage, HBX implemented in their online platform was to foster social and collaborative learning. By engaging the course participants in regular discussions, HBX triggered collaboration. They "introduced" students online, so they could "know" each other no matter that was only virtually so they could work together on assignments. HBX tied online collaboration to course grades, thus the students got involved in the "basic level" of participation that evolved further in the course from itself.[6]

Effective collaboration requires capability, commitment and continuity. The design principles of the platform are critical to fostering online collaboration. In order to achieve success in collaboration, one needs to design an engaging user experience, a place for the collaboration to occur – platform and an intriguing curriculum.[7]

Another successful principle is discussed by Dr. Shalamanov in his paper "Institution Building for IT Governance and Management," in which he thoroughly describes the good practices used in the successful implementation of the NATO Communications and Information Agency (NCIA). His focus is really on building and change management of IT organisation, but in general, the aspects covered in the article are applicable to any IT service-based organisation.[8]

According to Shalamanov, one of the key lessons is "to engage all the stakeholders in consultations for defining the governance mandate with its approval on highest possible level of the business organisation, supported by the IT structure mandated." He further elaborates that a "mandate is not just authority, but key mission and its parameters, including resource component". The author continues that "lack of a business case and clear mandate is limiting the understanding and support to the complex task of building IT organization and could undermine the effort with potentially high cost as well."[9] With these underlined best practices and lessons learnt in mind, a special attention needs to be paid when establishing the governance and maintenance of the ePlatform.

e-Platform Type

According to John Hagel from Salesforce, there are three common platform types that facilitate transactions, interactions and mobilization. On the one hand, "aggregation platforms facilitate transactions and connect users to resources". On the other hand, "social platforms facilitate social interactions and connect individuals to communities, and also tend to foster mesh relationship networks." Finally, "mobilisation platforms facilitate mobilisation and move people to act together, while fostering longer-term relationships to achieve shared goals."[10]

The ePlatform as envisioned in this paper, should be a mixture of those three types as it will be: 1) an aggregation platform for offering training and selling its IT products online to its defined user groups, 2) a social platform in its functions to connect individual to communities of their interest for job search, businesses to businesses (B2B), businesses to customers (B2C), and 3) a mobilisation platform in its core for fostering collaboration and taking common interests to the level of action, as well as encouraging "people to act together to accomplish something beyond the capabilities of any individual participant", where the "key focus here is to connect with, and mobilize, a given set of people and resources to achieve a shared goal."[11]

Besides the three common kinds of platforms already in existence, a new mixed type has emerged as a dynamic environment which are the learning platforms that accelerate improvement for all participants. Learning platforms represent a mixture of the social and mobilisation platform type that "facilitate learning, bring participants together to share insights over time and are fostering deep, trust-based relationships, as participants have the opportunity to realise more potential by working together."[12]

User Groups

The platform herewith proposed will provide an environment for online collaboration that will offer a set of services to include IT consulting, training, and opportunities for the realisation of its users. The platform will provide for a close symbiosis between the four main user groups as depicted in Figure1: students and IT professionals, academic bodies, businesses and employers, government and international organisations.

For students and IT professionals the platform will offer IT training and certification, and employment opportunities. For academic bodies the platform will provide collaboration services with government and international organisations, business companies and other academic bodies for their research and opportunity to offer training. For businesses and employers, the platform will have services that provide IT skilled staff, collaboration between businesses and employment organisations, government and international organisations, and IT training for hired personnel. Specialised IT courses will be developed for preparing IT professionals and executives of international organisations such as NATO, Eurocontrol, UN, and the European Commission in accordance with their specific requirements, i.e. competence-based training to fulfil job description requirements. These services will be offered to government and international organisations.

Figure 1: ePlatform User Groups.

"Platforms behave as tools, media whose primary feature is to empower and enable independent exchanges to happen in ecosystems and to enable long tail market economies: platforms are designed for customers' (users, peers, entities) delight, appreciation and use." Platforms focus on empowering services, learning contexts, relevance, enabling transactions and unifying experiences.[13]

Revenue Model

The revenue products of the collaboration platform will be designed for the following groups of potential customers as depicted in Figure 2: a) business companies and entrepreneurs, who wish to train IT skills of their personnel; b) higher educational institutions such as universities or research institutions, who could use the platform to perform their IT online training and research; c) qualified teachers, instructors, and lectures, who wish to perform individual IT training; d) students, who wish to upgrade their skills and train postgraduate; e) IT specialists, who wish to upgrade their level; f) disabled people or children without parental care, who wish to find realisation from home, using their IT potential; g) IT specialists, wishing to search for a career in international organisations as NATO, Eurocontrol, United Nations, and European Commission; h) budgeted institutions and governmental organisations for their own staff retraining courses.

The platform revenue model is foreseen to be achieved through variable subscription model supplemented by payments. The variable subscription model is

foreseen, as depicted in Figure 2 and it will provide varying levels of access and use.

- Individual Subscription – free and partially featured subscription. A few courses, or course sample included in the subscription. Options to subscribe to communities for collaboration. Free listing on job search. Options to purchase courses of interest.

- Individual Plus – 25 EUR per month on annual basis. It is designed for individuals who wish to undertake full list of courses included in the subscription. Free listing to job search, subscription to communities of interest for collaboration and business opportunities.

- Business Light – 250 EUR per month with one year commitment. This subscription plan is designed for companies and will provide an option for SMEs to train their professionals and to organise team training with specific training needs (up to 10 people). Subscription includes B2B communities and collaboration with research institutes/academic bodies in financial grants/ projects.

- Business Pro – 1000 EUR per month with one-year commitment. This subscription plan is designed for companies and will provide an option for SMEs to train their professionals and to organise team training with specific needs (up to 50 people). Subscription includes B2B communities and collaboration with research institutes/academic bodies in financial grants/ projects. Options to create their own training course in the platform.

- Business Enterprise – Designed for large organisations with enterprise support. It will be the most fully featured subscription plan and it will be possible to purchase it only through a platform representative and is priced on a company-based case.

ePlatform Architecture

The initial architectural design is created to establish a basic structural framework for the platform. It is meant to describe how the platform is seen to be realized with the known technologies and the computer system architecture it belongs to. It is envisioned that the platform will have an artificial intelligence module based on "pull-based" approaches into the architecture so the platform could automatically be responsive to the user requirements or give suggestions for topics that would be of interest to the user.

According to Shalamanov, "the basis for effective engagement and development of proposals is the Service Catalogue of the IT organisation, dependent of the IT architecture to support different services." Furthermore, he continues with definition of an effective IT organisation. It is "a service-based one, not asset management focused." He suggests that "all the assets are transformed in capabilities and they are transitioned to services with key performance indicators (KPIs) and cost. Then the process continues into presenting the services in IT catalogue along with the business model to consume these services, and if required, to be used in the development of service level agreements (SLAs).[14]
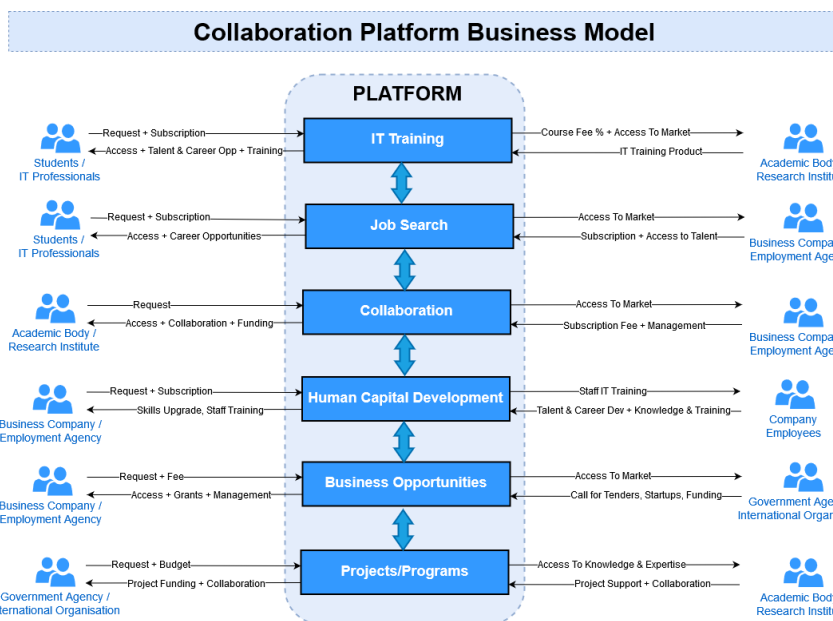
Figure 2: ePlatform Revenue Model.

Application Architecture

The platform will be using a 3-tier application model to include: a presentation layer, an application processing layer (business logic layer), and data management layer (business data layer). Usually this model is chosen for a distributed system for the purpose of scalability, because each layer can be distributed on a different server. The platform needs to be highly scalable and the services made available to multiple users and different user groups whose number will increase and, in theory, it should be possible that the number of users of the platform to increase infinitely.

As described in Fig. 3, the presentation layer in an application presents the information to the user with all user's interaction. In the presentation layer, the platform users will be able to have dashboard view, list of courses, course progress, chat, agenda, and calendar, access to all subscribed services or possibility to subscribe for new services. The application processing layer implements the business logic of the application. This layer will present the business components, collaboration components, course contents, search and retrieval of data, workflow components, import/export components, logging/ security, error handling, video content management/media management, encoders and other components. The data management layer will do all operations concerned with databases. The platform's data layer will contain the knowledge database, relational database management system (RDBMS), video database, courses database, customers' database, companies' database, and other data modules.[15]
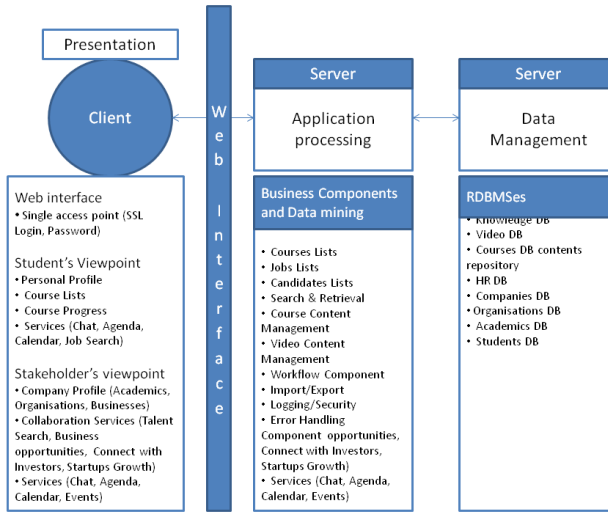
Figure 3: Three-tier Application Architecture.

ePlatform Cloud Architecture

"The world is rapidly become digital and obviously the classical education cannot remain as it stands today. The global competition transfers more and more training activities online, and the reasons quite vary – from financial (saving) and technological (more educational opportunities such as streaming, 3D modelling, etc.) to organizational (we can get access to the world's best speakers) and others (for example, we want to graduate in parallel at several universities), and the labour market is pressing us for more and more qualifications and interdisciplinary skills, where the internet training has undoubted advantages."[16]

Referring to Bosch, Sommerville states that "the system architecture affects performance, robustness, distributability and maintainability of a system," and therefore choosing the architecture may depend on non-functional system requirements like performance, security, safety, availability and maintainability.[17] The most important advantages of cloud computing are: resource sharing, extensibility, concurrency, scalability, fault tolerance and transparency.

Cloud computing model provides high scalability by creating virtualized resources that are made available to users. These processes are done in the background and the users do not need any skills in order to use the cloud computing concept. The users are simply logging into the application they are willing to use which connects to the server where the application is installed. According to researchers, cloud computing is one of the new technology trends likely to have a significant impact on teaching and learning environments.[18]

Considering the multiple stakeholders implementing the platform in the cloud would be the proper scalable technical implementation solution in order to deliver a high quality of service to its users' demand when using the services of the platform.

"With the ambition to provide more and more IT services of critical importance for the customer and through the infrastructure that is not owned/ controlled by the customer, it can be accepted" that another important key factor for successful implementation is the cyber resilience for all IT services offered. Cyber resilience will put an additional cost to the customer, yet no IT organisation should make compromises on it, considering its overall importance for the organization. The cost of cyber resilience should be integrated in the IT service catalogue from the very beginning of service design.[19]

Figure 4 illustrates how the platform's architecture will be implemented in the cloud. Cloud computing provides access to hardware and software resources for business organisation to use. This new business model in technology helped organisations to reduce costs yet to receive on-demand availability of computer system resources, data storage and computing power in accordance with their business needs.

The platform will be using Infrastructure as a Service (IaaS) for virtual machines and storage, Platform as a Service (PaaS) to get the runtime environments and development and deployment tools, and Software as a Service (SaaS) to help deliver the platform to the customer, its software licensing and services.
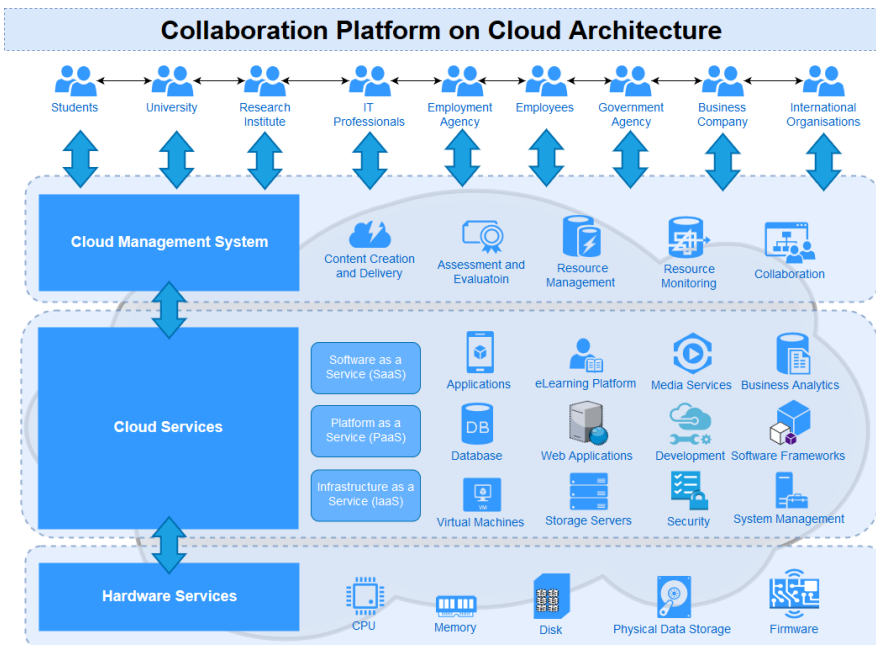

Figure 3: ePlatform Software Cloud Architecture.[20]

Conclusion

Today, platforms have become the means of getting everyone connected with everyone else, while delivering modern services as desired by users and keeping the transaction costs of the services in the background to almost zero (PaaS). This became possible also due to the evolution in technologies and the availability of components such as bandwidth, computing power and storage. Another reason for the boom in platforms is the possibility to connect for almost each device from phones to tablets, laptops, desktops, and all kinds of smart devices, that brought a whole new meaning to the word "interconnectivity."

This paper suggests that developing a software platform could provide a solution for creating an online space for IT people cluster, human resource development, competencies management, collaboration and online education. The platform will help resolve issues in the IT education by offering training to fill up the gap in its users' IT education to date. In addition, it will help in maintaining IT competencies and creation of a pool of IT professionals ready to upgrade their skill set or undergo a career change. It is assumed that the proposed solution will increase the capacity and competitiveness of IT specialists who wish to work for a government institution or international organisation. The platform is also oriented towards helping career starters and university graduates. The overall benefits the platform will bring are economic, seen as stimulation and support of collaboration in the IT industry and social effects, seen as providing free IT education in the platform for youngsters deprived of parental care and children with disabilities.

Due to the fact that "modern training requires, on one hand, the availability of a sustainable and powerful ICT infrastructure and, on the other hand, sets qualitatively new requirements to the levels of support and competence of the responsible employees and technical maintenance specialists,"[21] this paper suggests that the platform should be implemented in the cloud, because of the scalability, profitability and low risk the cloud architecture provides.

Acknowledgement

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