A Business Architecture for Enterprise IT-as-a-Service: Towards Influencing Business Strategy and Achieving Financial Transparency from within Corporate IT

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Abstract—**Enterprise IT/ICT units are under pressure to tidy up their operations, respond to business priorities quickly, perform efficiently and be as competitive as external service providers which has been a driver for the adaptation of the IT-As-A-Service (ITaaS) model. Despite its benefits, due to the nature of the ITaaS model which implies the service delivery engagement may be initiated by the service consumer rather than the provider, corporate IT functions adopting an as-a-service model may lose the proactivity that is required to drive innovation, influence business strategy and add business value by enabling the enterprise to gain strategic advantages, especially when it comes to shared ownership of risks. How corporate IT can become a proactive driver to influence business strategy in an as-a-service setting needs more elaboration. This paper proposes a business architecture for enterprise ITaaS focused on enabling IT functions to drive innovation and enable strategic business influence while achieving financial transparency.**

Index Terms—**IT-as-a-service, ITaaS, IT service delivery model, corporate IT management, IT value for business, business architecture.**

I. INTRODUCTION

In today's world, ease of access to as-a-service options in the IT landscape has made it possible for enterprise Lines of Business (LOBs) to seek services directly from external providers. Whilst information security and classification constraints and other technical issues have decreased the ease in lifting and dropping solutions in the private or public cloud, the push has been strong enough to put enterprise IT functions under the pressure to be more agile, more accommodating, quicker in responding to business priorities and objectives and at the same time, be risk-taking and risk-sharing, which has been a driver for enterprise IT entities to adopt an "as-a-service" delivery model. Initially, ITaaS could be viewed as an overarching perspective over the other types of "as-a-service" cloud computing paradigms like Infrastructure-As-A-Service (IaaS), Platform-As-A-Service (PaaS) and Software-As-A-Service (SaaS) and change of investment model for business users around IT resources and services [1]. However, in a broader view, it could be viewed as an "operating model" according to which an enterprise IT entity can be architected.

Enterprise IT as a Service (E-ITaaS) refers to a service delivery model for corporate IT functions in which the entire corporate IT department acts as an external provider of service to the rest of the enterprise [2]. This also aligns with the fact that unlike the past when corporate IT departments were focused on managing and running technology platforms, nowadays they are seen as strategic business assets [3], as well as a catalyst for change to drive business transformations or to gain competitive advantage [4].

Corporate IT function leaders find it difficult persuading their clients that the risks involved in providing services directly, or indirectly, belong to the client and the dynamics of this conversation may sometimes result in corporate IT functions to lose their strategic influence and be seen as passive functions that do not embrace or promote innovation. On the other hand, the inherent passive nature of "as-a-service" model implies that the corporate IT function is not engaged unless a service is required by lines of business which are supposed to be the initiators of the conversations. As a result, innovative solutions and new ideas may not find their ways out of the corporate IT functions into the real business world by adopting an "as-a-service" paradigm. In real life, IT/ICT may be beyond just an enabler; it should sometimes be the driver for business strategy with the goal to achieve strategic advantage over competition. This paradox of passiveness and proactive influence on business strategy for enterprise ITaaS has not been fully addressed in the literature which has been an inspiration for this paper in which we propose a business architecture for an enterprise ITaaS unit with the goal to influence and drive business innovation while still providing financially-transparent and competitive services to lines of business.

This paper has been organized into the following sections. Section II discusses a literature review, section III discusses the proposed business architecture for an enterprise ITaaS unit, and section IV highlights future work opportunities while section V concludes the paper.

II. RELATED WORK

Object Management Group defines Business Architecture as "A blueprint of the enterprise that provides a common understanding of the organization and is used to align strategic objectives and tactical demands" [5]. One of the goals when architecting an enterprise ITaaS unit is to ensure the perceived business value of IT is maximized. The business value of IT has been linked to a number of factors like organizational structure, management practices, competitive and macro environments [6], [7]. Ensuring the alignment of IT strategies to business strategies has been highlighted as one of the approaches to increase the business value of IT around which an alignment model has been

proposed by Henderson, J. *et al.* which discusses alignment in the four perspectives of strategy execution, technology transformation, competitive potential, and service level, which promotes the idea that business strategy should be the driver for IT [3]. In another view, Enterprise Architecture (EA) frameworks and their utilization have also been pointed out to be other mechanisms of aligning IT to business strategies [8]. However, there are also cases where the realization of business strategy may depend on specific underlying IT capabilities [9] which indicates cases where business strategy may be affected by IT/ICT. One of the efforts to link business strategy and IT/ICT has been made by G. Versteeg *et al.* where they used "ICT innovation" as a driver for business strategy. In their model, new opportunities presented by ICT innovations are to be included in the business strategy statements to become most effective [10]. On the other hand, JW Ross *et al.* see Enterprise Architecture as the source for defining strategic limits to inform strategic initiatives to be executed in a "foundation for business execution", consisting of business processes and IT/ICT infrastructure [11].

When utilizing Enterprise Architecture for an enterprise, one of the common concerns is how to align its utilization with mainstream IT service management frameworks like Information Technology Infrastructure Library (ITIL) [12]. There have been multiple attempts on integrating enterprise architecture with a service design/delivery frameworks like ITIL. Among them, Christian Braun *et al.* have proposed a mapping between the views and models in enterprise architecture to IT services as a way of integrating EA and ITIL [13]. There are others who have narrowed down the problem to specific enterprise architecture frameworks like TOGAF [14]. S. Thor has argued that organizations can use ITIL and TOGAF at the same time citing that ITIL and TOGAF are both architecture frameworks addressing different concerns: TOGAF focusing on architecture development and ITIL focusing on service delivery [15].

When devising a business architecture for a corporate ITaaS entity, all the above concerns and findings have been taken into account to ensure that the proposed business architecture enables the corporate to turn its IT function into a strategic asset to gain competitive edge and improve overall corporate performance, as the baseline requirements to be addressed.

III. A BUSINESS ARCHITECTURE FOR AN ENTERPRISE ITaaS ENTITY

This chapter describes the proposed business architecture for an enterprise ITaaS entity in different architectural views after providing the theoretical foundations for the proposed model.

A. Theoretical Foundations

In compiling the proposed business architecture for an ITaaS entity, different theoretical foundations have been used around Service Systems, Enterprise Architecture (EA) and ITIL/EA integration. A "Service System" is defined as "a system in which human participants and/or machines perform processes and activities using information, technology, and other resources to produce products/services for internal or
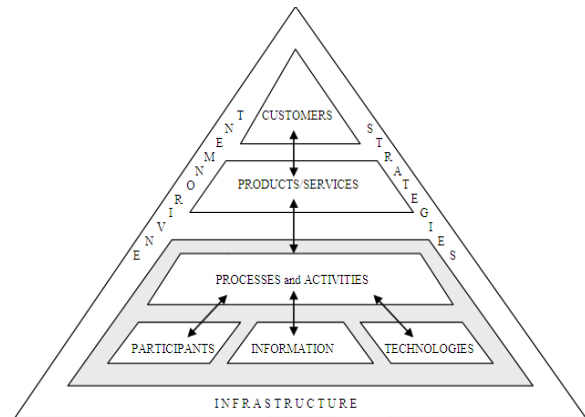
external customers", as Fig. 1 illustrates [16].

Fig. 1. Elements of a service system (Alter, 2006).

Accordingly, an Enterprise ITaaS entity could be viewed as a service system interacting with lines of business to provide a set of consumable services, as Fig. 1 illustrates. Fig. 2 illustrates the proposed logical grouping of entities in an enterprise ITaaS entity.
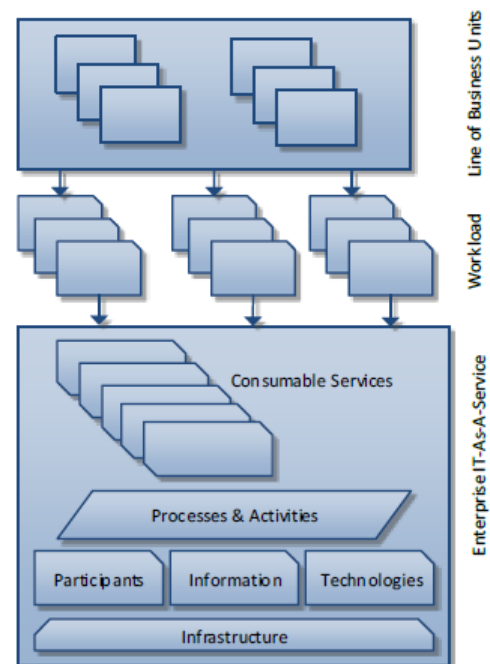

Fig. 2. Proposed view of an enterprise ITaaS function as a service system.

Another theoretical foundation for the proposed business architecture is JW Ross *et al.*'s definition for a "foundation for business execution" which puts enterprise architecture as the central point to define strategic limits and core capabilities while being updated through an engagement model [11]. The third theoretical dimension relates to attempts that are focused on integrating EA and ITIL [15]. And finally, the practical aspect which has driven the development of the proposed architecture include how to architect an enterprise and its ICT entity to turn it into a strategic asset and even drive and influence business strategy from the corporate ICT function while also covering service costing and finance-related aspects of corporate IT service delivery.

B. Vision and Mission Statements

The mission of a generic enterprise ITaaS entity could be summarized as "*Enable efficient and reliable business service delivery through* technology *solutions*".

The vision of a generic enterprise ITaaS entity could be articulated as "*Drive innovation* and *enable strategic advantage over competition through enabling streamlined and efficient ways of delivering services or products*".

C. Business Objectives Catalogue

Table I illustrates a set of business objectives for a generic enterprise ITaaS entity.

TABLE I: PROPOSED BUSINESS OBJECTIVES CATALOGUE FOR A GENERIC ENTERPRISE ITaaS ENTITY

Objective
Keep business-enabling and business-critical infrastructure online for at least 99.9% of times
Increase IT's customers satisfaction scores to at least 90%
Reduce IT service delivery timeframes so that at least 95% of customer requests, incidents, problems or issues can be resolved within the designated timeframes as per the SLAs.
Reduce the number of production incidents to the designated optimum minimums.
Reduce ICT project delivery timeframes so that at least 95% of such projects can be delivered within the designated timeframes.

D. Business Functions Catalogue

TABLE II lists a generic list of common business functions within an enterprise ITaaS entity.

TABLE II: PROPOSED BUSINESS FUNCTIONS CATALOGUE FOR A GENERIC ENTERPRISE ITaaS ENTITY

Business Function
Infrastructure Management
Cybersecurity Management
Portfolio, Program and Project Management
Content and Digital Presence Management/ Systems Development and Delivery
Solution Architecture
Customer Support Services
IT Governance
Customer Experience Design Management
Corporate Integration Management
Information Management
Research and Development

As will be discussed later on, due to its role in driving strategies and overall influence in corporate performance, an Enterprise Architecture function has been considered external to the ITaaS entity in the proposed business architecture and instead, a Solution Architecture practice has been cited as an internal business function of the ITaaS entity. Depending on the setting, not all listed business functions may exist in an enterprise ITaaS unit. For example, in certain circumstances, an enterprise may totally outsource its systems development endeavors while relying on its Solution Architecture function to architect the blue prints for and govern the outsourced implementation while managing the outsourcing through its Portfolio, Program and Project Management function.

E. Architecture Stakeholders

Table III lists the architecture stakeholders for a corporate ITaaS entity.

TABLE III: PROPOSED ARCHITECTURE STAKEHOLDERS

ID	Stakeholders
S1	*Chief Information Officer*
S2	*Enterprise Lines of Business Managers*
S3	*Chief Executive Officer*

F. Architecture Concerns

Table IV lists the architecture concerns when for developing a business architecture for a corporate ITaaS entity.

TABLE IV: PROPOSED ARCHITECTURE CONCERNS

ID	Concern Description
C1	*How does the enterprise IT entity move away from the traditional funded-by-the-establishment model into a funded-by-service-delivery model?*
C2	*How does the enterprise IT entity proactively influence business strategy despite the passive nature of as-a-service paradigm?*
C3	*How are lines of business enabled to compare and pick the most cost-effective service provider when receiving services?*
C4	*How is it ensured that the IT entity is aligned with business strategy?*
C5	*How is financial transparency achieved to enable better decision making for the selection of services?*

G. Architecture Viewpoints and Views

As per the definitions, architecture views are "work product expressing the architecture from the perspective of specific concerns" and architecture viewpoints are "work products establishing the conventions for the construction, interpretation, and use of architecture views to frame specific concerns" [17]. Accordingly, Table V illustrates a number of viewpoints and their mapping to the concerns they frame.

TABLE V: PROPOSED ARCHITECTURE VIEWPOINTS AND CONCERNS MAPPING

Viewpoint	C1	C2	C3	C4	C5
ITaaS Financing Viewpoint	✗		✗		✗
ITaaS Organization Viewpoint	✗	✗		✗	

1)   ITaaS financing viewpoint
a)   Overview

The ITaaS financing viewpoint is used to frame the finance-related concerns and provide details on modelling schemes and conventions used to describe how the architecture addresses those concerns.

b)   Concerns framed by viewpoint

The ITaaS Financing Viewpoint frames C1, C3 and C5.

c)   ITaaS service costing view

Fig. 3 illustrates a metamodel for service costing for an ITaaS entity. In this metamodel, Service has been considered as an abstract concept that is turned into a consumable Service Instance once a Service Provider Line of Business, A Service Costing Unit (i.e. Full-time Equivalent, Number of Servers, Hours, Number of Incidents etc.) and a Service Context (e.g. Solution X, Project Y, Product Z) are associated with it.

The fact that services can have a "parent" service has been

embodied as a one-to-many relationship between the service entities. All Service Instances upon which a certain service instance directly or indirectly depends can be populated to

articulate the detailed direct or indirect costs involved in a consumable service.
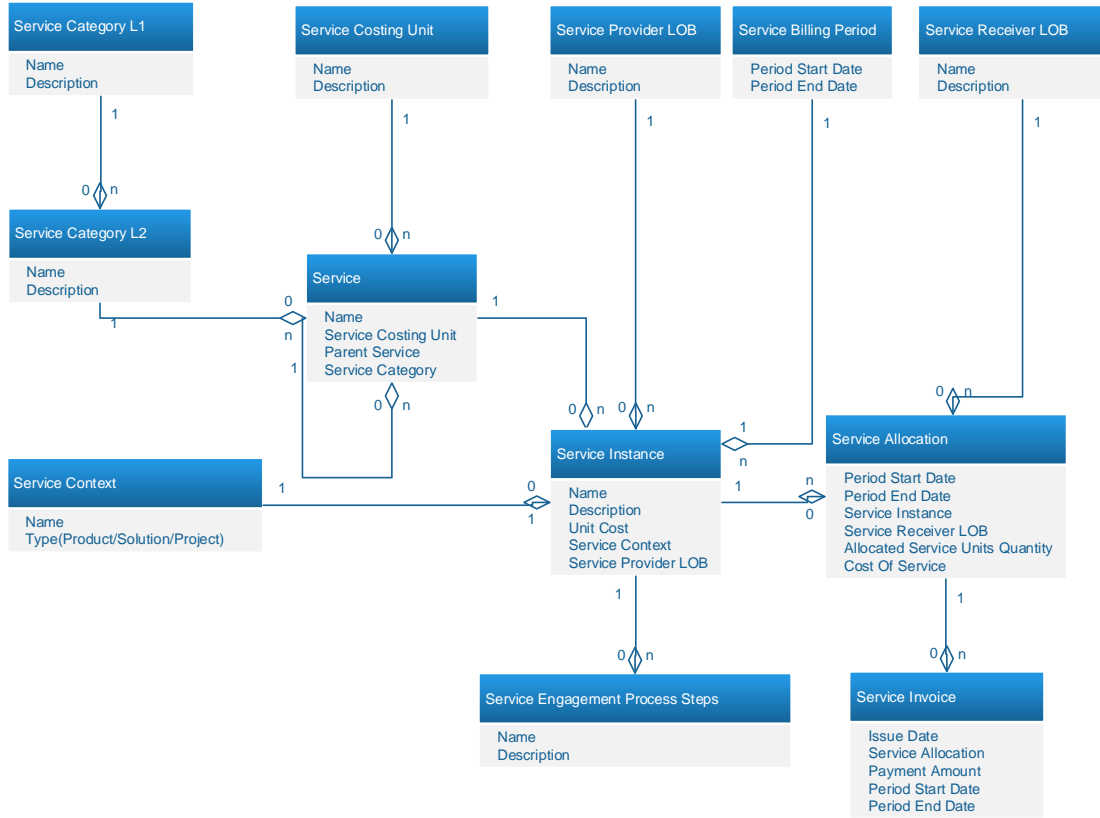

Fig. 3. A proposed metamodel for service costing.

As will be discussed under "ITaaS Services View", the enterprise ITaaS entity may also internally operate some behind-the-scene Enabling Services like IT Governance or Change Management that impose some costs to the entity but may not be directly consumed by lines of business. Connecting such services to consumable services in a hierarchical structure enables the ITaaS entity to transfer the ongoing costs of its behind-the-scene "Enabling Services" as part of its end-to-end catalogue services that are visible to the lines of business. As the result, financial transparency is achieved by providing lines of business with the detailed list of all directly and indirectly consumed services and the quantities of services they have received.

Accordingly, the total cost of a consumable Service Instance could be calculated based on Equation (1).

$$Cost(S, P) = \sum_{s \in M} C(s, P) . U(s, P) \qquad (1)$$

where S is the consumed Service Instance; P identifies a period in which the costings are calculated; $U(s, P)$ is the Unit Cost for Service Instance s during period P; $C(s, P)$ is the Allocated Service Units Quantity that are consumed for Service Instance s during period P and M is a set which includes all Service Instances that S depends upon in a multi-layer hierarchy of connections between services, either directly or indirectly.

Assuming that the ITaaS entity should cover all the costs

of its behind-the-scene Enabling Services as part of its operations, the on-going costs of enabling services may be carried away to be recovered in the next billing period over the entire set of provided consumable services, which results in varying baseline Unit Costs for Enabling Services per each period, as shown in Equation (2).

$$U(S, P) = \frac{T(S, P)}{\sum_{l \in L} C(l, S, P)} \qquad (2)$$

where $U(S, P)$ denotes the Unit Cost for Service Instance S in period P, $T(S, P)$ denotes the actual incurred costs of running Service Instance Service Instance S in period P by the ITaaS entity, $C(l, S, P)$ denotes the Allocated Service Units Quantity of Service Instance S in period P consumed by line of business l, and L denotes the set of all lines of business that have consumed Service Instance L in period P.

d)   ITaaS Service Life Cycle View

Fig. 4 illustrates a reference model for service life cycle in an ITaaS setting, which is aligned with ITIL V3 service life cycle model [18], except for the fact that it includes billing and finance related processes and artefacts. In addition to normal ITIL-related processes, the proposed life cycle model also includes steps around the definition of Service Costing Units during the Service Design stage as well as Service Metering/Billing and Service Key Performance Indicator Monitoring processes during the Service Operation stage. This supports the achievement of financial transparency in the delivery of services and enabling insightful decision

making around the use of services for lines of business. Enabling tools and processes to capture and monitor service use should be provisioned and utilized to ensure that lines of business receive detailed quotes and invoices throughout the delivery of services.

Apart from the normal ITIL-related processes, Service Enterprise Architecture Alignment Verification Processes, Service Design & Development Processes, Service Metering Processes, Service Billing Processes, and Service Performance Monitoring Processes have been added to the reference model in order to ensure that the service strategy and all newly-created services remain aligned with the business strategy through enterprise architecture verification, and that the foundations and processes required to support financial transparency are embedded in the life cycle of services.

2) ITaaS organization viewpoint

a) Overview

The ITaaS Organization viewpoint is used to frame the concerns related to the organizational structure and provide details on modelling schemes and conventions used to describe how the architecture addresses those concerns.

b) Concerns framed by viewpoint

The ITaaS financing viewpoint frames C1, C2 and C4.

c) ITaaS services view

There are multiple definitions for a "service" in the literature of services science. In one definition, a service is "a provider-client interaction that creates and captures value" [19]. ITIL 2011 defines a service as "a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks" [20]. When developing a reference model for a generic Enterprise ITaaS entity, it is also reasonable to consider the characteristics of a service which highlight that services should be intangible, heterogeneous, value centered, process oriented, non-inventoriabe, non-resellable, co-produced, and consumable at the point of production [19].

Accordingly, Fig. 4 illustrates a services reference model for a generic enterprise ITaaS entity.
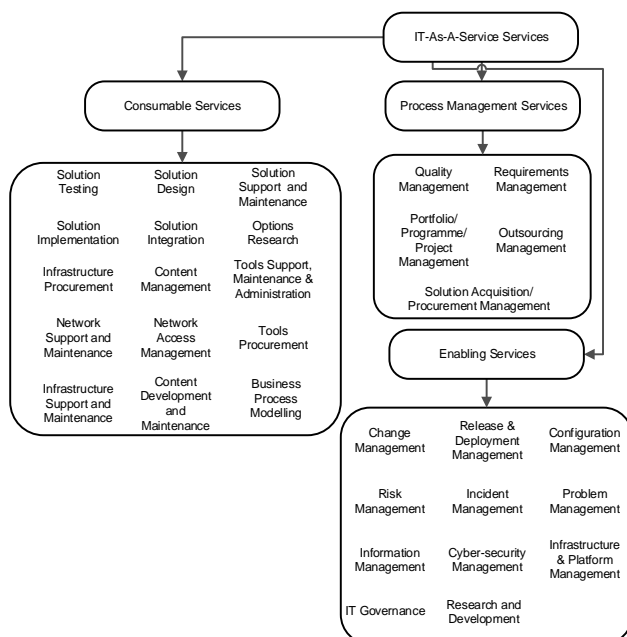

Fig. 4. A proposed reference model for the services of a generic enterprise ITaaS entity.

Among the services that are provided by a generic enterprise ITaaS entity, some are enabling services that are not directly consumable by the lines of business, however, they are necessary to keep the IT/ICT entity running and enabled. In a way, the weight of the running costs for these enabling services could be transferred to and broken over the costs of all the consumable services. Logically, it is assumed that with an ITaaS arrangement, the corporate IT entity is considered as external entity that exists to provide services to the rest of the enterprise and that it should not impose any other costs to the enterprise other than the services it provides. Under that constraint, as discussed earlier, the ITaaS entity can break down such costs over the costs of the consumable services of the next billing period to achieve financial transparency. This also ensures that at all times, the ITaaS entity is run like a business with the goal to be efficient and contestable.

d) ITaaS organization structure view

Through the included reference model, this view tries to frame how the proposed business architecture addresses concerns C1, C2 and C4 in relation to influencing business strategy and assuring alignment with business strategy.

Fig. 5 illustrates a reference model for the organizational structure of an enterprise with an ITaaS entity. It has been attempted to resolve one of the common paradoxes around IT's role in business strategy which is the result of the fact that even though it is often assumed that IT architecture should follow and be aligned to business strategy, business strategies also depend on IT capabilities to be realized [9].

The proposed organizational structure reference model borrows its foundations from JW Ross et al.'s proposed models on creating a foundation for business execution using an Enterprise Architecture (EA) function. On one hand, the EA function defines strategic limits when strategic initiatives are being devised and on the other hand, through an engagement model, it defines core capabilities in the enterprise while it also updates and evolves architecture by being influenced via the engagement model. The IT engagement model has been defined as "the system of governance mechanisms that ensure business and IT projects achieve both local and enterprise-wide objectives" [11], which is why the EA function has been linked to the corporate or division's Program, Project and Portfolio function.

Accordingly, in the proposed reference model, the EA function has been considered closer to the function linked to business optimization, performance management, organizational structure and process architecture rather than pure IT and ICT functions as E. A. Marks cites [21]. This explains why it has not been considered as part of the enterprise ITaaS entity.

On the other hand, the requirement of enabling IT to help enterprises gain strategic advantage over their competition, and to enable the ITaaS entity to drive and influence business strategy, have been addressed via a number of interactions between the EA function and the ITaaS entity.

While the Solution Architecture practice which is part of the ITaaS entity is guided by the EA function, it also informs and validates assumptions and architectures through these interactions with the EA function. A Research and Development function in the ITaaS unit can also inform the

EA function of new possibilities and opportunities that can help the enterprise gain strategic advantage over competition while they are validated according to the boundaries set by the EA function. This ensures that innovative technology solutions can somehow find their way to drive strategic initiatives and prevent the ITaaS entity from becoming a passive entity that only provides services when engaged. In achieving this goal, the fact that the EA function is the strategic governance and driving engine for the enterprise and its business can assure that those ideas and innovative solutions that are aligned with business strategy or can change and drive the strategy, can eventually find their way through to implementation. This is achieved through a cycle of validation and influence, driving strategic initiatives, and eventually, the embodiment of those ideas as tactical solutions that will be delivered by the enterprise ITaaS entity.
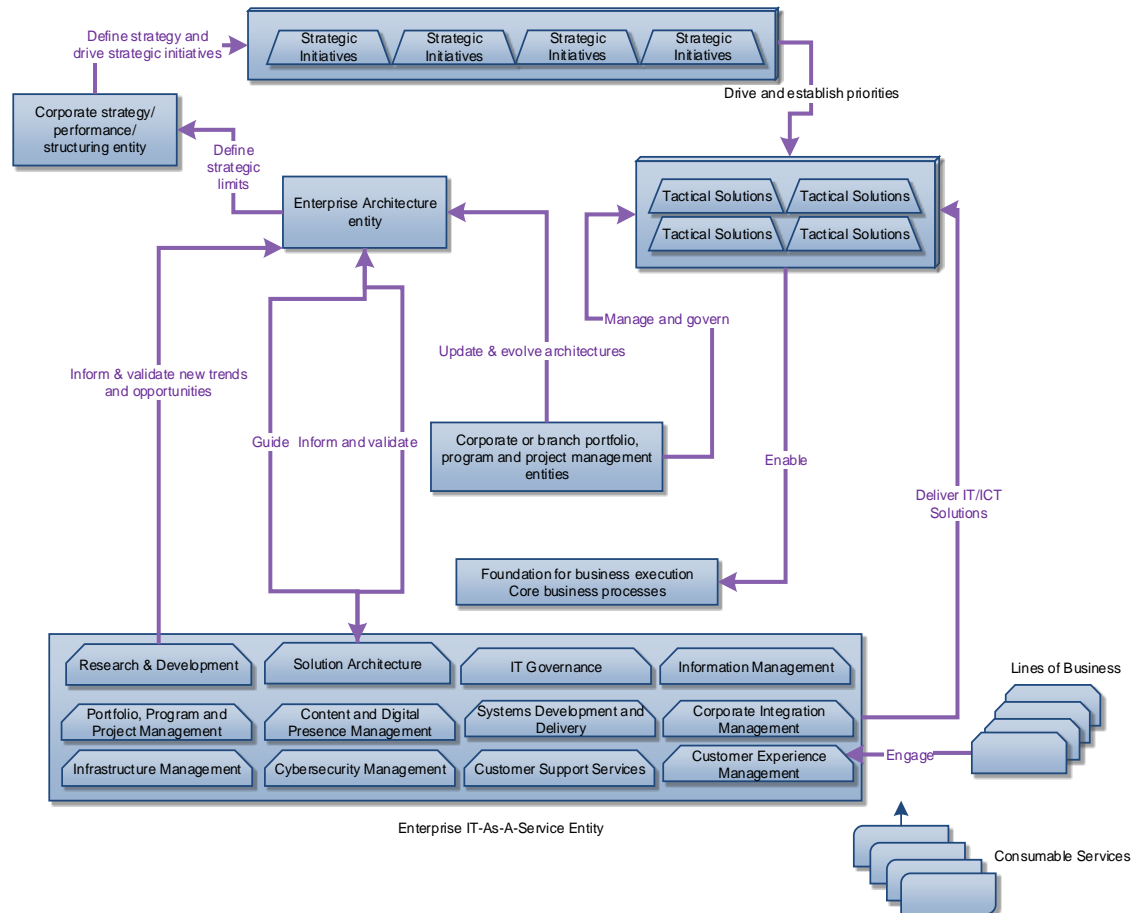

Fig. 5. A proposed reference model for the organizational structure of an enterprise with an ITaaS entity.

The engagement point for lines of business with the ITaaS entity has been considered to be a "Customer Experience Management" function within the ITaaS entity with the role to own the holistic user, business, product and service experience design for the ITaaS unit which can lead concept development, software and hardware product design, as well as User eXperience (UX) strategy development.

IV. FUTURE WORK

Whilst this paper provides the foundations on how an ITaaS business can be architected to deliver outcomes and be turned into a strategic asset, future work can be directed into improving and advancing the financing and service billing models to increase the clarity on how and ITaaS entity can truly operate without dependence on traditional establishment funding sources.

V. CONCLUSION

In this paper, a business architecture for a corporate IT function operating based on an enterprise ITaaS model has been presented that makes it possible for corporate IT to achieve the potential to influence business strategy and enable the enterprise gain strategic advantage over its competitors. It tries to address the paradox of passiveness in the "as-a-service" model and the strategic influence of the enterprise IT unit which requires proactive generation of innovative business-enabling technology solutions while it also provides a framework on how to model and cost services to achieve financial transparency while delivering consumable services.

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