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Towards an Unified Information Systems Reference Model for Higher Education Institutions

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Abstract

Higher education institutions are currently facing many challenges that are making them to start compete strategically, like other not-for-profit firm. To adequately support such new approach, their information systems and business strategies should be totally aligned. However, the current existing landscape of heterogeneous information systems and applications deployed in many institutions can compromise such aim. Recently, reference architectures and models have emerged as instruments suitable to help company's decision-makers to cope with such tensions. However, whilst many of such architectural models already exist for several industries, little has been done so far in higher education. In this paper, we briefly review major existing developments in such way before to inductively derive a unified information systems reference model tailored for higher education institutions.

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1. Introduction and motivation

Higher education is one of the main engines of progress around the world through its well-known functions of mass tertiary education, academic training and research, and the provision of public service[1]. Although this sector still retains historical foundations that give continuity and support to its functions, modern higher education institutions (HEIs) are currently facing many environmental challenges, including internationalization and globalization processes, reduction of public funding, the emergence of new educational technology and new legal and quality assurance requirements derived from recent educational reforms boosted by the Bologna process[2,3]. To cope with such challenges, educational institutions have started to act like several other for-profit companies prioritizing not only their role of public good and service knowledge providers but also the development of adequate competitive strategies to improve their competitiveness [4]. Such trade-off places enormous pressures on HEIs in terms of operational efficiency[5,6], which furthermore, should be achieved without diminishing the quality of educational service provided[7]. Hence, HEIs "*must undergo a major shift in terms of their managerial approach*"[4], leading to a profound impact on how institutions manage their processes, services and structures; and making them to evolve into a framework where such elements become instruments of flexibility and innovation, rather than barriers to growth and development[8]. As the vast majority of HEIs can nowadays be viewed as both human- and knowledge-intensive organizations[9], Information Systems Architectures (ISAs) emerge as critical instruments in such kinds of operational change initiatives, as they play a critical role in supporting several different institutional educational processes, as well as providing users with appropriate data[10–12].

One the one hand, and at present, many information systems (IS) landscapes at HEIs are merely the ad hoc configuration of each organization mainly based in bespoke developments, sometimes mixed with functionalities resulting from external software products commonly arisen for other industrial sectors and later adapted and updated[13–17]. On the other hand, and in order to streamline their organizations' activities[18], HEIs need to take advantage of their ISAs, ensuring that resources invested in Information Technology (IT) systems are based on business strategic objectives. As a result, there is a continuous and increasing growing tension between business (requirements) of the educational institutions and their available technological capabilities, which should be managed holistically in an integrated and coherent way[19]. Hence, only "*when business and IT are perfectly aligned, firms are able to perform at a high level due to the close cooperation between business and IT departments and their mutual understanding*"[20].

Enterprise Architecture (EA) is considered as one of the major instruments for enabling companies to cope with such alignment tensions[5,6,21]. The significance and practical relevance of this topic has been historically highlighted by IT managers[22,23] as well as by HEIs IT Managers[24,25]. However, wilts EA management practices have been adopted in several industrial firms[26], they have not yet been pervasively used in higher education settlements[27,28]. This fact has been confirmed by several empirical studies[29], ranking business/IT alignment maturity in education as the lowest compared with several other industries. Hence, there is a clear need for more research on EA practices in higher education contexts[30], including "*the feasibility of formalized frameworks and components of EA specifically tailored to suit the structure of HEIs*"[31].

Over the last years, and drawing on principles of generalization and knowledge reuse[32],Reference Architectures (RAs) and Reference Models (RMs) have emerged as abstract artifacts suitable to increase the quality (i.e. the efficiency and effectiveness) of EA practices and designed architectures[19,33–36]. Hence, notable RMs and RAs have been developed for several specific industries, as BIAN[37] for the banking industry; the eTOM framework[38] for the telecommunications industry; or TOGAF[39] or CORA[40] for the IT industry, to cite a few. In contrast, little has been done so far in the higher education industry, although several initial interesting contributions[41–45] can already be identified (mainly) from the *grey literature*. However, and in general terms, it can be concluded that scientific research in RAs/RMs for HEIs is still in an embryonic stage.

In order to partially cope with the previous gap, we focalize in the concrete topic of IS and applications in HEIs. Hence, the main goal of this work is, to derive and propose a preliminary *IS Reference Model for Higher Education* contexts. In so doing, we also see the work at hand as an opportunity for creating awareness on the IS community

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