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Towards a Human Capabilities Conscious Enterprise Architecture

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Abstract: This conceptual paper argues that enterprise architecture (EA) should move towards a conscious human-centered conception of the enterprise. Employing the conceptual methodological approach of theory synthesis and drawing on the extant literature in enterprise architecture as well as pertinent social and organizational theories, we suggested foundational propositions that could holistically serve as a theoretical lens for (re)viewing the foundations of EA within a progressive conscious enterprise agenda. The novel contribution of the paper is the introduction of human capabilities approach (HCA) as a method theory, to supplement systems and stakeholder theories, for design and evaluation of enterprise architecture in the modern enterprise. The paper concludes by showing the implications of the propositions for practitioners and researchers.

Keywords: enterprise architecture; human capability approach; socio-technical architecture; stakeholder theory; sustainability

1. Introduction

Enterprise Architecture (EA) is the blueprint that drives business and information technology (IT) decisions in an organization or organizations that share the same or similar vision and mission [1–3]. According to Lapalme et al. [4], EA is an integrative concept that binds the socio-technical organization, built from interacting components, with its ever-changing environment using accepted enterprise design and governance principles. Alternatively, EA can be understood as an abstraction of the interactions among the enterprise, its environment, and technology in current as well as in possible future states [1].

The history of EA began perhaps in the 1960s with IBM's Business Systems Planning (BSP) methodology, although it was not until the second half of the 1980s that the first framework was published [5]. Since then, EA has been developing in several distinct yet interrelated fields including industrial engineering, organizational theory, computing, and information systems.

In their widely cited work, Lapalme et al. [6] captured the progression of EA in three stages; i.e., the technical, the socio-technical, and the ecosystem schools [6,7]. The three schools represent the historical evolution of EA in which the technical is subsumed under the socio-technical, which in turn is appropriated and expanded by the ecosystemic. Initially, EA was driven by technical approaches inspired by engineering and architecture methods [8]. The focus was on IT architecture and the view was relatively mechanistic and reductionist [7]. In the socio-technical systems view, the aspiration was to create positive synergy between the technical and social constituents of the system and yield joint optimization of the needs of individuals and the organization [9]. The ecological adaptation school extends the previous two views to embrace the ecosystemic concerns of society to achieve innovation and sustainability [6]. The focus is therefore shifting towards *value systems* [7].

As the ecological adaptation view takes root, EA research interests are orientating towards the integration, standardization, and elaboration of EA's non-technical and theoretical foundations [10–12]. The need for a holistic treatment of EA to account for changing economic, environmental, and human conditions is also emphasized by several researchers [4,11,13]. However, we feel that the EA literature has not yet given human values and human capabilities the place they deserve in EA design. Secondly, despite the many theories employed in EA, we understood that EA's theory and practice are less informed by human capabilities consciousness and, to some extent, stakeholder theory, which could better align with the EA of the future [14–16].

We aim to address these gaps by positing human capabilities conscious EA as a logical extension to the enterprise ecological adaptation school [4]. In this paper, we introduce the human capabilities approach (HCA) as an integrative framework to promote a human-centric EA approach. In the tradition of conceptual studies [17], we hope to *envision, explicate, relate,* and *advocate* for human capabilities conscious EA [18,19].

The aim of this work is thus twofold. The first is to sensitize practitioners to the need for and potentials of embedding human capability conception in the design and evaluation of EAs. The second aim is to present the EA research community with potential areas of further investigation in creating theories and tools for instilling human capability consciousness in EA design. In reaching these aims we hope to encourage the communities of research and practice to design and adopt formal mechanisms that would allow EA to function in an environment where the demand for equity, justice, sustainability, and relative progressive ideals is high [4,13].

We designed our investigation based on the prescriptions of Jaakkola [20] and Mora et al. [21]. As a conceptual study, our attempt was to systematically assemble, organize, and interpret theories and concepts pertinent to human capabilities consciousness in EA to create new avenues of application in research and practice [21–23]. Rigor in the conceptual paper is achieved through identifying the knowledge gap; justifying the selection of theories; explicating the role of the theories; and arguing via claims, grounds, and warrants [20,21]. Hence, in Section 2, we framed the appreciation, or the lack thereof, of the higher purpose of the enterprise and what it entails to EA as a knowledge gap. In Section 3, we explicate and justify the selection of the theories considered for the study followed by the description of the roles each play. Section 4 presents the propositions which are the culmination of the chain of logical reasoning beginning with the justification for the existence of the enterprise. The propositions are the pillars that support the human conscious EA. The fundamental implications of the propositions are forwarded in Section 5. The paper concludes with a discussion of the potential areas identified for further inquiry. Figure 1 captures the conceptual flow of the paper.
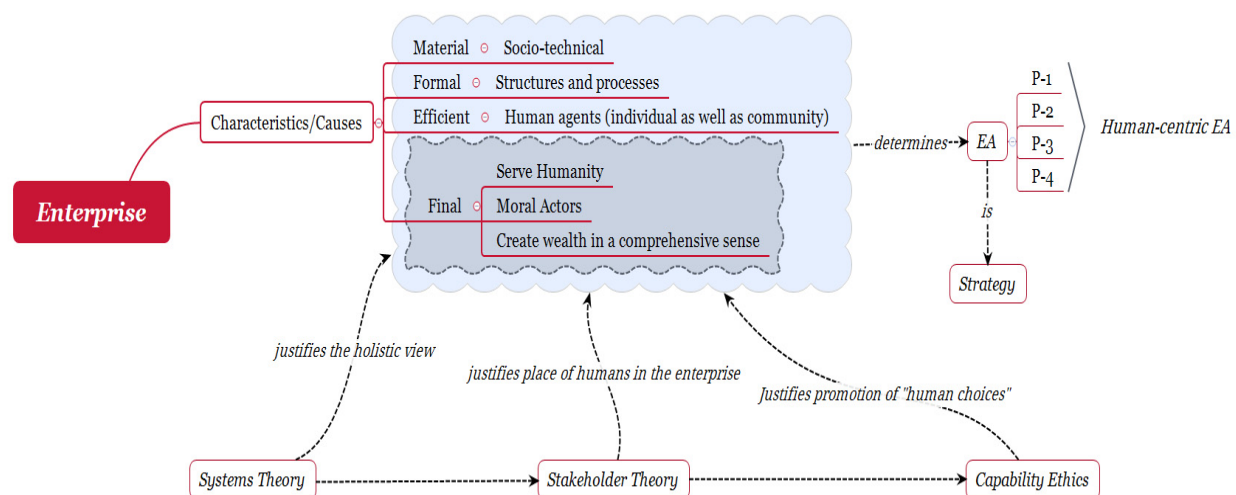

Figure 1. Conceptual flow of the paper.

2. The Higher Purpose of Enterprise Architecture

Humans have long recognized the importance of organized work to achieve higher levels of efficiency and effectiveness. However, as human societies progressed, the pure profit motive started to take center stage in most organizational endeavors whereby humans (employees, customers, etc.) became instrumentalized to the extent that they are considered extensions of technical tools to achieve an economic benefit for the enterprise [24,25]. There are cases where enterprises *instrumentalize*, *dehumanize*, and *alienate* their stakeholders, except perhaps for the stockholders [26]. *Instrumentality*, an aspect of the notion known as *objectification*, occurs when the *objectifier* uses the *objectified* human or animal as a tool for the satisfaction of the *objectifier's* goals [27]. *Dehumanization, on the other hand,* is the process by which a human is stripped of his innate *individualness* by the actions or behavioural manifestations of other humans, institutions, or even by self [27]. *Alienation* is the notion that a human engaged in an exploitative economic relation is estranged from work, the fruits of his labour and ultimately from his *species-essence* [27].

The *pure profit motive* and unscrupulous manipulation of society by enterprises are not however without consequence. Social thinkers from Aristotle to Marx and Sen forewarned us of the imminent social discord due to cynically exploitative economic relations [18,28]. Consequently, there have been pressures to transform organizations through redirection of their focus from *shareholder profitability* to *societal prosperity*. This is an invitation to reevaluate and redefine the purpose of organizations.

In Aristotle's metaphysics, any physical (for example, a building), spiritual (for example, music), or social (for example, the enterprise) construction would have a material, formal, efficient, and final cause [29–31]. This final cause (telos), which justifies the existence of the construction, is also its ultimate purpose. The telos is especially apparent in human-made systems, organizations for example, since humans apply consciousness, intentionality, intelligence, and deliberation in designing such systems.

Enterprises are higher-order complex systems constructed from socio-technical components that are purposefully designed by humans to realize a goal or mission [32–35] (In this paper, the word *enterprise* assumes two related yet slightly different meanings. In the first generic sense, an enterprise is an organization created by humans to attain their efficiency and effectiveness goals [32]. In this paper, the word *organization* can sometimes appear in lieu of *enterprise* within this broader context. The second flavour is a referent to the specialized sense the word is used in EA. In this sense, the enterprise can be an organization, a set of organizations, or even an organizational unit tied together to serve a strategic purpose [32]. In this context, we used only *enterprise* as in *enterprise architecture*.). Any typical definition of an enterprise recognizes these fundamental constituents of the system, namely socio-technical elements (material cause), an entrepreneurial agent (efficient cause), interconnections (formal cause), and a reason for existence (final cause) [36]. Given this recognition, the question arises as to what the overarching purpose of enterprises, and by extension, EA, is. To answer to this question, we must look at developments in several societal endeavors.

First, organizations are moving away from exclusively technical-, material-, and owner-centered thinking towards a holistic, human-value driven, and stakeholder-centered thinking and decision making. There is a growing understanding that enterprises, in principle, can and should be ethical, producing a win for all stakeholders (investors, employees, customers, suppliers, environment, and society) [26]. As a result, stakeholders are taking center stage in many organizational decisions.

Secondly, we are witnessing marked progress in human consciousness [37]. Inequalities are being challenged everywhere [37]. Individuals as well as society are becoming more conscious about the impact of their actions towards other humans/societies, other species, the physical environment, and future generations.

Thirdly, digital technologies are making us more connected, but at the same time more predictable, controllable, and homogeneous [38,39]. Preserving individual and societal heterogeneities is something desirable unless the goal is to create a regimented, tech

dystopia full of robot-like humans. Ethics is therefore becoming intrinsic to technological designs with the objective of maintaining and expanding human capabilities [38,39].

Bringing these strands of social development together, Enderle [40] asserts that organizations: (a) can plan and operate within the limits of environmental constraints, (b) are *moral actors*, and (c) have the purpose of creating wealth in a comprehensive sense, i.e., physical, human, natural, and social wealth or capital. The Stiglitz-Sen-Fitoussi commission report [41] concurs with the latter assertion. Solomon [42] (1024), within the narrower context of business, describes the organization as "a human institution in service to humans and not as a marvelous machine or in terms of the mysterious 'magic' of the market". The higher purpose of enterprises, therefore, should be to serve humanity and Enderle's principles can serve as a progressive platform to promote diversity, humanism, and ethics in designing our enterprises [26,43].

EA, as a strategic tool that translates the enterprise values and strategy to information system services, naturally inherits the purposes of the enterprise [3,44]. Enterprises should, out of necessity, put in place an EA that not only accounts for economic, social, and ecological consideration but also human choices. EA will also have to adapt to the social, psychological, and technological changes in society to stay relevant [2]. For instance, Gartner's *emergent architecture principles* [16,45] suggests that the future is for *goal-oriented* and *rule-bound* actors. Goal-orientation means that employees may want to promote their own interests without necessarily prevailing over organizational objectives [46]. Rule-bound, on the other hand, implies that EAs need to avoid detailed specifications and allow for choice within the bounds of a minimal rule set. Active ecological adaptation [6] is therefore sought in EA to allow people to pursue well-being, human growth, and social development [43,47]. There is a need for change in the conceptualization of enterprise design towards the humanization of enterprises and the affordance of meaningful work bringing human capabilities center stage in EA planning and evaluation. We call the new EA, which will be built on these tenets, the *conscious enterprise architecture* (adopted from [26]). This could also be considered as a logical extension to the enterprise ecological adaptation school of EA thought [6].

The consciousness we are referring to is a consequence of the understanding that decision making at all levels is value laden. It calls for foregrounding moral values of human dignity and justice in designing products and processes. In Section 3, we draw on systems theory, stakeholder theory, and the HCA to forward certain propositions in support of a conscious EA. In passing, we note that while moral agency ranges from the micro (individual) level to the meso (organizational) and macro (system) levels, the hierarchic nature of systems allows us to safely assume that what applies to the lower-level agents also applies to higher level agents. Thus, when we talk about organizations, we are also referring to economic (national) systems.

3. Contributing Theories

3.1. Theory Sampling

Organizations use EA to align their business and technology strategies [12,13]. In this role, EA's efficacy is contingent on the organizational foundations, which form a tight linkage between the business and its technology. The concepts that describe these foundations can be found in related fields of study such as organizational theory, technology, ethics, and economics. By drawing on these fields, EA knowledge is evolving towards an increased understanding of stakeholder engagement, organizational sustainability, and ecological adaptation.

Researchers have suggested tens, if not hundreds, of theories for use in EA. For example, Kotusev et. al. [14] compiled a list of 32 theories proposed or actually applied in EA. They also provided a database of 123 theories which have potential for use in EA. Obviously, there may be theories in diverse domains as economics, management, philosophy, sociology, etc., whose potential is yet to be acknowledged in EA. Within

practical limits of time and space, we selected two theories from EA and another from economics to argue for human capabilities conscious EA.

The selection of the theories followed the procedure suggested by [15]. In the method of [15], we include a theory *t* to the set of theories **S2** from a potential list (kernel theories) **K**, if *t* satisfies the **S1** of properties. As indicated in Section 1, our intention is to propose an integrative framework that could extend the ecosystem school of EA thought. As such, our **S1** is made of characteristics a theory, method, or tool must satisfy to support the ecosystemic view [6,7].

We made a purpose sampling of the theories by reading the description of the kernel theories provided in Kotusev et. al. [14]. We considered systems and stakeholder theories as domain theories as they already have some application in the EA literature [14,15]. We deployed the HCA as a method theory to serve as an integrative framework. The HCA provides supplementary value by informing the other two theories [20]. See Table 1 for tentative evaluation of the theories based on some essential characteristics of ecosystemic EA. The sources cited are only exemplars.

Table 1. Potential of selected theories to accommodate and expand ecosystemic EA.

Characteristics of Ecosystemic EA (S1)	Theories (S2)		
	System Theory	Stakeholder Theory	HCA
Holism [6]	+ [15,35,48]	?	+ [49,50]
Business ecosystem (diversity of inhabitants) [6,51]	+ [35,52]	+ [53,54]	+ [55,56]
Fosters organizational innovation, sustainability, and organizational coherence [6,51]	+ [52]	+ [57]	+ [58]
System-in-environment coevolution [6,51]	+ [35,52]	+ [59]	+ [58]
Emergent Behavior [51]	+ [35,52]	-	?
Self-organization [51]	+ [35,52,60]	-	+ [61]
Decentralized governance [51]	+ [60]	-	+ [62]
Collaboration, competition and co-opetition [51]	+ [60]	+ [63]	+ [63]
Environment can be changed [6]	+ [52,64,65]	?	+ [58]
Joint design of all organizational dimensions [6]	+ [52]	+ [63,66]	+ [58]
Dialogue fostering [6]	+ [67,68]	+ [63,66]	+ [69]
Larger group facilitation [6]	+ [67]	+ [63]	+ [70,71]
Fostering sense-making [6]	+ [52,72]	+ [53,54]	+ [56,58]
Value sensitive design [73,74]	?	? [53,54]	+ [58]

Key: (+) Conforms; (-) Does not conform; (?) Incomplete.

3.2. Systems Theory

Systems theory is an overarching analytical framework for diagnosing universal problems [35,36]. It does not seek to explain; rather, it seeks to magnify and expose the interactions among system components and their environment, which yield a certain outcome [52]. In the context of organizational management, systems theory challenges the mechanistic world view propagated by bureaucratic management and identifies organizations as organic entities composed of interacting components existing in a hierarchic structure within an environment [64,75,76]. Hence, instead of using reductionism and linear causality, systems thinking relies on holism and causal loops to expose the intricate causality relations that exist within organizations [77].

A system is defined as a set of interacting components, organized in a certain fashion to achieve a certain goal. The system is defined by its components and their interaction, its boundary, and its behavioral output (purpose) [36]. The purpose of the system is what essentially determines the system's behavior [36].

Giachetti [33] (4) describes an organization as "a complex, socio-technical system that comprises interdependent resources of people, information, and technology that must interact with each other and their environment in support of a common mission." As it appears, Giachetti's definition is anchored on systems theory in so far as it addresses the three fundamental constituents of a system, i.e., elements, interconnections, and a reason for existence [36]. On Boulding's eleven-scale hierarchy of systems, organizations are placed at the complexity levels of 9–10, identified as societal systems [32,34,35].

Organizations are open, organic, dynamic, allopoietic, goal-directed, and meaning-driven systems, the behavior of which is tempered by the environment [35,78]. Complex human systems exist for a purpose, and the purpose creates a context that in turn gives meaning to all the activity that takes place in that context. Campbell, Coldicott, and Kinsella [78] conclude that in the context of bigger social systems such as organizations, the overall purpose of unleashing systemic thinking is to understand the context under which people operate and how that context modifies behavior.

3.3. Stakeholder Theory

The predominant thinking in business has been that the interests of the owners should always get primacy over all other interests. Agency theory for instance, considers management as the agent of the shareholders on whose behalf financial investments should multiply [79]. The agents (management and other employees) are expected to channel their efforts to achieve organizational goals instead of their own personal objectives [80–83]. In this view, economic value is the single most important bottom line that matters. Hoogervorst [25], while asserting that coherence and consistency should be essential characteristics of an enterprise in the interest of human stakeholders, contends that enterprises are promoting the interests of shareholders at the expense of other stakeholders (particularly of employees).

Standing in direct opposition to theories that exclusively promote shareholder value, stakeholder theory attempts to expand the bottom line of the enterprise by incorporating the interests of several stakeholders in business decision making. Stakeholder theory holds that a host of stakes should be considered when determining the purpose of the enterprise. The emphasis on the value of all stakeholders in corporate decision making is not only ethical but also strategically sought [79,80].

Stakeholder theory is unapologetically moralist. It invokes a wide variety of moral theories such as *common good principles*, *feminist ethics*, *Kantianism*, and a *doctrine of fair contracts* to justify its essence and aspirations [84]. Stakeholder theory is consequently prescriptive in its approach [79].

A stakeholder is defined as someone with interest in the development, operations, outputs, and ecological outcomes of a system [85]. The stakeholder could be a person, a group of persons, or a societal system such as an organization. Six groups of stakeholders are recognized in the literature, namely, employees, customers, investors, suppliers, society, and the environment [79,86]. Some of these stakeholders are individual human beings while others can be groups of individuals, organizations, or even non-humans.

According to stakeholder theory, organizations are expected to create value for their stakeholders not only to ensure the latter's continued engagement but also in the overall interest of shareholders [53]. That is, organizations should not attempt to separate shareholder value from the values of other stakeholders [53]. For example, the employee expects to gain wellbeing, security, and equity; the customer looks for product or service quality, safety, and transparency; and the investor expects to get an economically sensible return on investment [79,86] without jeopardizing the interests of others.

Despite its insistence on the need to embrace and advance the needs of all stakeholders, stakeholder theory understands that some stakeholders are more important than others by virtue of their merit [79,84]. An overly loose interpretation of stakeholders in any enterprise may lead to financial ruin, shareholder disenchantment and desertion [87]. Therefore, we

use the term stakeholders to describe people that have a major and legitimate stake on the organization [79,80,88].

3.4. The Human Capabilities Approach (HCA)

The HCA was first proposed by the Nobel laureate Amartya Sen in a series of works that he and his collaborators published starting from the 1980s [89,90]. Several people have contributed to the expansion of the conception and application of the HCA in so many domains [89].

First and foremost, the HCA is a paradigm in economic thinking that is posited against classical welfare economics [91,92]. The HCA is a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change [93].

The core claim of the HCA is that assessments of well-being or quality of life of a person, and judgements about equality or justice, or the level of development of a community or country should not primarily focus on resources, or on people's mental states, but on the effective opportunities that people must lead the lives they have reason to value [91,93]. Unlike resource based economic theories, the HCA focuses on the ends of well-being rather than the means. Having this or that resource may not matter at the end if those resources do not expand the capability space of the owner. The means are, therefore, instruments to bring humans to their higher order goals of increased well-being, justice, and development [93]. Thus, the HCA targets the promotion of human capabilities by which we mean the opportunity space available to humans to operate in [40,93].

The HCA takes an ethical-individualism stance arguing that we should only consider individuals as the decisive units of moral concern [94]. That does not, however, disqualify groups from coming into play when analyzing policy decisions or evaluating artefacts and structures.

According to the HCA, the ends of well-being, justice, and development should be conceptualized in terms of people's *capabilities* to function; that is, their effective opportunities to undertake the actions and activities that they want to engage in and whom they want to be. These *beings* and *doings*, which Sen calls *functionings*, together constitute the value of life [95]. Functionings include working, resting, being literate, being healthy, being part of a community, being respected, and so forth. The distinction between achieved functionings and capabilities is between what is realized and what is effectively possible; in other words, between achievements on the one hand, and freedoms or valuable options from which one can choose on the other [89,93]. What is ultimately important is that people have the freedoms or valuable opportunities (capabilities) to lead the kind of lives they want to lead, to do what they want to do, and be the person they want to be. Once they effectively have these substantive opportunities, they can choose those options that they value most. For example, every person should have access to health services provided by the government. However, the HCA recognizes that a person may refuse to use e-health services available to the public for some personal or religious reason. The HCA is therefore focused on choice or freedom, holding that the crucial good societies should be promoting for their people is a set of opportunities, or substantial freedoms, which people then may or may not exercise in action: the choice is theirs. It commits to respect for people's power of self-definition.

When one talks of human capabilities it is of course within constraints. An agent operates within certain constraints when he/she tries to expand his/her functionings. These constraining factors make up the basis for sustainable decision making as the agent should recognize the impact of their decisions on current and future ecosystems [96,97]. Whether the functioning constraints are automatically loaded at time of decision making or are externally imposed is, however, a contested terrain [96,97].

Amartya Sen refused to provide a special list of capabilities, arguing that such a list would limit the applicability of his theory [95]. Instead, he suggested that organizations should develop their own list through continued dialogue with their stakeholders, which is consistent with the approach followed in Stakeholder Theory [40,95]. While

Sen's proposition is acceptable on one level, it rendered the theory impractical for several purposes [50,93]. Martha Nussbaum critiqued Sen's refusal to provide a list of common or critical capabilities, and went on to develop a core list of functionings. Nussbaum's central capabilities are: (1) life; (2) bodily health; (3) bodily integrity; (4) senses, imagination, and thought; (5) emotions; (6) practical reason; (7) affiliation; (8); Other species; (9) play; and (10) control over one's environment [19,98].

Martha Nussbaum was the first to show the intimate link between Sen's capability approach and Aristotelian ethics [19,91]. Nussbaum argued that the ultimate goal of achieved capabilities is what Aristotle called *human flourishing* [19]. Furthermore, she expounded on Sen's sketches and made its application in wider realms possible, which was immensely acknowledged by Sen himself [91]. Nussbaum's approach is now widely referred to as *capability ethics* to make a nuanced distinction from the *capability approach* of Sen [91]. Here, in this paper, we will continue to use HCA as consolidative term superseding both.

Gaining wider credence, the HCA has been in use in diverse domains including developmental and welfare economics, political philosophy, as well as in information and communication technologies for development (ICT4D) and other technology related domains [49,93]. In ICT4D, several research outputs have been produced that deployed the HCA as an evaluative framework for gauging the merits of artefacts in expanding human choices [99–102]. In the same vein, the HCA has obtained applications in the wider technology design arena [49,50,103]. Studies using the HCA as an ethical theory that guides corporate behavior are under investigation [40,104].

4. The Human Capabilities Conscious Enterprise Architecture

In Section 2, we argued that the higher purpose of the enterprise is to serve the overall flourishing of humanity. EA, as a systematic organizational view and a mechanism of organizational strategic making, should align to this purpose of the enterprise. Systems theory, stakeholder theory, and the HCA are used as foundations to build the proposed human capabilities conscious EA. In the following, we present four foundational propositions which lead us to the conscious EA. The propositions are a synthesis of the interactions between the EA literature and the theories covered in Section 3.

4.1. Enterprise Architecture as Socio-Technical Architecture

EA can be understood as a purely technical discipline aimed at modelling a system architecture to serve the interests of the enterprise. In such a conception of EA design, the technical component has been stressed much more than the social [59].

However, several researchers emphasized the need for a holistic treatment of EA [4,11,13]. Particularly, Lapalme et. al. [4], in a more extended treatment of EA prospects, stressed that a holistic analysis of EA which takes account of the changing economic, environmental, and human conditions is required.

Indeed, there are compelling reasons to support the holistic treatment of EA. To start with, the core of EA lies in the term *enterprise*, which is nothing but a socio-technical system [59]. Several management theories demonstrated that organizations and their governance cannot be explained through the exclusive use of engineering-oriented theories, techniques, and tools [105]. Secondly, technology is implemented in a social context [106]. Even when the technology is autonomously functioning, such as in self-driven vehicles, its use and the impacts thereof cannot escape social scrutiny. Thus, it might be instructive to understand EA as lying at the intersection of the enterprise, technology, and the enterprise ecosystem and therefore, the socio-technical approach seems appropriate in the study of EA. The holistic treatment of EA is possible when we conceptualize EA as a socio-technical architecture.

The theoretical basis for understanding EA as socio-technical architecture, and for our purpose, human-centric architecture is to be found in theories of management and architecture. More relevant to EAs are organizational theories which elevate the place of the human

element in the organization. Systems theory (see Section 3.2), for instance, captures the human as well as the technical components of the system with all the intricate relationships within and outside the bounds of the organization [107,108]. This holistic view forms the theoretical backdrop even for such ideals as stakeholder and sustainability theories.

Systems theory informs us that enterprises are socio-technical systems to the extent that (a) they are composed of human as well as technical components, and (b) they have values to uphold [34]. Furthermore, Daft [43] outlines four important characteristics of the enterprise, which are: (a) being a social entity despite the extended use of technology, (b) goal-directedness, (c) intentionality of design, and (d) having environmental interrelation.

Socio-technical situatedness is natural to EA. EA inherits all socio-technical design principles [68,109]. See Table 2 for sample quotations from the EA literature.

Table 2. EA as socio-technical architecture.

Socio-Technical System Meta-Principles for Design	Characterization of EA
Design is systemic, emergent, and context-sensitive	"[t]he fundamental organization of a system embodied in its components, their relationships to each other, and to the environment" [110] " . . . enterprise architecture is a system of systems" [48]
Values, organizational culture, and mindsets are central to design	" . . . the principles guiding its design and evolution" [110] " . . . all relations describing EAP [(enterprise architecture planning)] mechanisms and their effects are significantly moderated by organizational culture" [111]
Design involves making choices and trade-offs	"Normative principles limit design freedom. They are, however, not the only statements which limit design freedom. Requirements also limit design freedom." [112]
Design should be business and user-centered	The why and the who of the Zachman framework define the stakeholder and the business purpose as key components of EA. [113,114]
Design is an extended social, contingent process which is socially shaped	" . . . the lack of focus on the 'people' aspects of EA could be the reason why many organisations still struggle with EA implementation." [115]

Thus, an exclusively technical and structural understanding of organizations is impractical. An enterprise is a social entity consciously constructed by humans to achieve human goals [32,82]. The social and technical elements that make up the enterprise are in continuous interaction in the performance of the enterprise's essential functions to achieve stakeholder goals [43]. EA, as an extension to enterprise strategy, should therefore be considered as a socio-technical architecture designed to cater for the needs of stakeholders [47,59]. Hence, our first proposition is:

Proposition-1. *Enterprise architecture is socio-technical architecture.*

4.2. EA as an Instrument for Advancing Stakeholder Value

For a long time, the way stakeholders were conceptualized and treated in EA has been in a narrow, system user sense [116]. Only those stakeholders who interact with the EA by either providing inputs or those who must comply with the EA specifications were taken as stakeholders [116,117]. This narrow definition of the stakeholder in EA perceives the stakeholders as objects of interest which could be employed to achieve the goals of the enterprise. On the other hand, there is some level of recognition of stakeholders' needs, goals, and expectations in EA. For instance, the ISO/IEC/IEEE 42010:2011 standard acknowledges stakeholders with their concerns and views [118,119].

Several researchers have identified heterogeneity of stakeholder interests as one of the most prominent challenges in EA [2,3]. This variety in stakeholder values is not to be shunned, though. Rather, it is to be captured, magnified, and converted to beneficial

organizational capabilities. The strategic role of EA is to serve as an instrument for creating common understanding and reference among the stakeholders of the enterprise who often times have conflicting interests and views [120]. In this strategic view, we assert that the stakeholder is an actor with his/her own choices and interests, and the relationship should be one of mutuality. Thus, EA should expand the choices of stakeholders. In this way, we can tightly tie the interests of the shareholders, the other stakeholders, and the organization in general. Articulating the needs, goals, and expectations of the various stakeholders and striking a balance among the competing interests of stakeholders would therefore be the task of the enterprise architect [118,120]. This is what we call the conscious EA.

Haines, Aller-Stead, and McKinlay [108] indicated that a system may seek to achieve multiple outcomes as it is composed of system components with different goals. The implication of Proposition-1 is recognizing all stakeholders as goal-directed, and channeling EA design towards advancing the values of the stakeholders. As allopoietic societal systems, organizations depend on external as well as internal entities, who define their purpose [35]. As a result, the purpose of the organization can only be fully investigated through stakeholder analysis and stakeholder value realization [35]. Here, *values* are broadly defined and include any utility the stakeholders may draw as a matter of their engagement with the enterprise [79]. These values include economic (material) values such as financial remunerations earned by employees, dividends drawn by shareholders, services extended to communities, employment opportunities opened for citizens, taxes paid to government, etc. [73,74]. However, they also include human values with moral import such as welfare, privacy, bias avoidance, universal usability, trust, autonomy, creativity, etc. [73,74].

The conscious EA notion aligns with stakeholder theory, which requires enterprises to manage for stakeholders. This notion is consistent with ethical and just organizational leadership principles which could draw mutual trust and benefits to all stakeholders [79]. The sustainability of the enterprise is also dependent on such transparent and fair arrangements of enterprise management. The conscious EA is representative of the essential evolution of the organization towards higher levels of integration and differentiation all at the same time [52]. Through this transformative process, the organization works to "serve both its members and its environment" [52].

The transformation of the enterprise from a mechanistic, to a biological and finally to a socio-technical (socio-cultural) mode entailed changes in its goals. In the mechanistic mode, enterprises are shareholder focused; in the biological mode, they are survival focused; but in the socio-technical mode, they expressly work to serve all their stakeholders [52]. In support of this position, we put forth the following proposition:

Proposition-2. *Enterprise architecture is an instrument for promoting stakeholder values.*

4.3. Social Sustainability as a Criterion in EA Design

Sustainability is a practical manifestation of systems thinking. More generally, sustainability is striking a balance between the needs of current and of future generations [121]. Sustainability is defined by [122] (11) as "adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future".

In the context of EA, the Enterprise Integration school of EA [6] holds that EA aligns strategy with technology [123–125]. Enterprises are moving fast to address not only intra-generational but also inter-generational environmental and social concerns [123]. Yet, economic sustainability still boasts an exalted position [126] relegating social sustainability to a less important status. Scant attention seems to have been paid to human capabilities in EA research and practice [127]. Instead, stakeholders (employees, customers, etc.) appear to be instrumentalized to the extent that they are considered as extensions of technical tools to achieve an economic benefit for the organization [24,25].

The HCA is a framework which addresses the social aspect of sustainability as it provides for the evaluation of the impacts of social actions on human capabilities within the context of the structures they are operating in [128].

Several researchers have shown the link between the sustainability approach and the HCA [96,127,129,130]. Burger and Christen [127] argue that the HCA is a natural fit for sustainability as both claim to have normative power and universal validity. The two are also linked to actions intended to improve the quality of life of humans [127]. Corporate social responsibility policies that foster stakeholders' *choices* further justify the use of the HCA within a sustainability program [131,132].

The ultimate purpose EA should therefore be to preserve and expand human capabilities of current and future generations. In this relation, sustainability is coming up as a progressive research agenda in the EA literature. In parallel, the HCA, with a substantial contribution to sustainability thinking, is being promoted as a valuable theoretical framework in ICT4D and technological design fields. We therefore forward the following proposition:

Proposition-3. *Social sustainability is a critical criterion in Enterprise architecture design.*

4.4. Promoting Human Capabilities Is an Ideal EA Should Promote

According to systems theory, the evolution of hierarchic systems is from the lower to higher, which implies that the purpose of the supersystem is to serve the purposes of the subsystems [36]. The modern stakeholder is someone who not only works to achieve corporate objectives but their own objectives as well [46,133]. Thus, the purpose of the EA is expressed in the multiplicity of stakeholder goals. What is not obvious though is the specific interests of the stakeholders. We argue for the deployment of the HCA in EA in the order to account for and promote stakeholder values and social sustainability [18,91]. The HCA promotes the expansion of human choices [55] thereby removing the unfreedoms which limit humans from living the life they choose [99]. The HCA suggests that a process, system, or technology to be deployed in a social context shall extend the capabilities of humans [49].

The HCA makes a clear distinction between the characteristics of goods and the functionings that a person achieves because of the use of the goods. The focus of the HCA is on the functionings [40]. For instance, if we take a higher education institution, the technical side of EA may dictate the acquisition of hardware and software that meet certain functional and non-functional quality specifications. On the other hand, the HCA informs EA to favour hardware and software that could expand the capabilities of the students, teachers, alumni, etc., by way of expanding their opportunity to flourish. This could be in the form of opportunities of research funds, networking, educational opportunities, research collaboration, etc.

Consistent with stakeholder theory, the HCA recognizes the plurality of the values individuals want to achieve both in quality and quantity [40]. Therefore, an EA that attempts to cater for only a single value of the human stakeholder is ineffectual. Taking the previous example, a higher education institution may, for various reasons, take the wrong assumption that serving the *academic needs* of the student would suffice. However, *academic needs* may mean several things to a student or group of students. In addition, the student may have psychological, philosophical, religious, etc., values to promote, which may not be covered by the academic goals. Therefore, the institution needs to look at human flourishing needs instead to stay relevant in the long run.

To demonstrate how stakeholder capability co-creation is possible in EA via the HCA, in Table 3 we present a mapping of stakeholder values to the central human capabilities [19]. We employed the three classes of EA stakeholder roles (*producers*, *facilitators*, and *users*) provided in [116]. Producers are those involved with EA planning and development. Facilitators, on the other hand, are those who plan, manage, maintain, or sponsor EA work. Users are those who provide input, requirements to EA and receive products and services.

We added a fourth class for the *community* the enterprise operates in. Note that the classes are not mutually exclusive, and the role of a stakeholder may vary from organization to organization.

Table 3. Mapping the co-creation of EA stakeholder capabilities (adapted from [63]).

Human Capability	Stakeholder Roles			
	Producers	**Facilitators**	**Users**	**Community Members**
Life	Ensure work safety and security; protection from premature death; flourishing	Preservation of investment; competitiveness; resilience; flourishing	System product/service safety; protection from premature death; flourishing	Production safety (Ecological); quality of life
Bodily Health	Ensure work safety and security	Preservation of investment; sustainability and resilience;	Ensure bodily health; provisioning of good health, nourishment, and shelter	Ecological improvement; access to health
Bodily Integrity	Ensure freedom of movement; security against any form of violence including online harassment; privacy	Preservation of investment; privacy	Freedom of movement; security against any form of violence including for example online bullying	Access to facilities, services, and resources (within limit)
Sense, imagination, thought	Ability to express self; ability to create/innovate; education and training provision	Supporting innovation and sustainability	Self-actualization; self-expression opportunities	Supporting community capacity building through training, education, collaboration
Emotions	Motivation and job satisfaction	Social investing; corporate social responsibility; ensure justice and security	Safe emotional engagement with others; maintenance of cultural values	Supporting community development; human rights and peace
Practical Reasons	Input to quality management system; stakeholder engagement; capacity to exercise practical reason	Meaningful sponsor participation	Informed choice; freedom of conscience	Community planning; involvement in decision making; opportunity expansion
Affiliation	Meaningful social interaction; ensuring freedom of assembly; ability to have uncensored communication with others	Joining a community of sponsors or facilitators; engagement with other leaders	Meaningful user interaction; dignity	Meaningful community-producer interaction; intra-community interactions
Relation to nature (Other species)	Ability to show concern for the ecosystem; Green information system	Sustainability investment; Corporate social responsibility	Benefit from green products and services	Green future;
Play	Work–life balance	Supporting innovation	Capacity to play	Capacity to benefit from green investments
Control over environment	Being able to work as a human being; equal employment opportunity;	Property right protections; transparency	Free participation in the political and economic life of the society	Transparent local democratic participation; citizenship

As noted in Section 2, organizations could play the negative role of alienation, repression, and domination in many societies. This is because there are tensions among the owner, manager, employees, and the wider community as the interests of all these groups often diverge [134]. Table 3 demonstrates HCA's utility as a theoretical counterweight to instrumentality and the associated theories of dehumanization and alienation [135]. This is a worthy agenda to consider in EA theory and practice. We suggest the HCA as a conceptual bond to bring forth stakeholder value promotion and sustainability to EA theory and practice.

Within the wider domain of EA, the HCA may be used in:

1. establishing the information base necessary to perform the mission of the enterprise;
2. setting up the structures requisite to implement the enterprise mission;
3. determining the kinds of principles that place design limit on EA;
4. determining the technologies necessary to perform the mission of the enterprise as well as promote the welfare of humans and their environment;
5. determining the techniques and tools used in EA planning and implementation; and
6. evaluating or comparing EA efforts from human function achievement perspective.

Adopting the HCA as a guiding framework would mean anchoring EA design on the principles of equity, justice, well-being, and human agency. EA Principles that reflect the capability promoting ideals of the HCA would guide the design of technologies and structures. The techniques and tools of EA development would become capability sensitive, inclusive, and participatory. The overall goal should, however, be embedding human capability consciousness in EA [70]. As such, we forward the following proposition:

Proposition-4. *Promoting human capabilities is an ideal that EA should promote.*

5. Implications of Stated Propositions

What follow are the implications that emanate from the propositions presented in Section 4.

5.1. Generic Implications

The role the HCA can play in EA can be understood with the use of the *cartwheel* model of Robeyns [56]. In Figure 2, core characteristics of the HCA lie at the center. At the end of each of the spokes radiating from the center are the modules, which define the contextual purpose and associated instruments and assumptions.

The cartwheel is like a template from which contextual implementations (capability theories) can be instantiated. For example, the HCA as applied in public health EA may take theoretical, ontological, and ethical assumptions different from when it is applied in a corporate EA context. Yet, there are elements which are commonly shared by all implementations of the template. The core (human capabilities) represents those shared elements [56].

The *purpose* defines the specific utility the HCA is serving in a project. For example, in the context of EA, the HCA could be deployed to develop principles that guide EA projects, or to evaluate impacts of implementations, or to make comparisons among artefacts or implementations, etc.

The *purpose* then determines the *meta-theoretic commitments* one may make. Empirical studies, moral argumentations, and qualitative evaluations may demand differing meta-theoretic commitments. For instance, Bolat [136] used the HCA within the grounded theory methodology to study mobile technology deployment with relation to innovation practices among business-to-business (B2B) firms.

A wide variety of *ontological and explanatory theories* are available to account for and explain human nature and choices. As an example [137], studied assistive technologies using the HCA and the biopsychosocial model of disability. On the other hand [138], deployed a HCA within a critical realist philosophy to study mobile phone use among people with

disabilities [139], showed the possibility of blending critical realism, hermeneutics, and complexity theory to develop a relational ontology of capabilities.

Figure 2. Cartwheel view of the HCA (adopted from [56]).

Then, *a selection of functionings and/or capabilities* is made considering the task at hand. For example, a list of capabilities based on empirical research could be selected [140]. It is also possible to use, for instance, Nussbaum's central capabilities [141] or other similar lists.

Measurement and empirical issues—methodologies, methods, techniques, tools, and data sets to be used are determined in line with the decisions made thus far. As an example [142], presented two empirical case studies from Brazil and Zambia drawing on the HCA and critical theory [140], discussed instances of both quantitative and qualitative empirical techniques employed along with the HCA.

An optional module in the cartwheel view is the use of *additional moral principles* to supplement or enrich the HCA. Where needed, the researcher or practitioner can add moral principles not accounted in the foundational capabilities. For example, [143] integrated procedural ethics with HCA and value-sensitive design in a humanitarian cargo drone study.

In conclusion, the HCA provides a range of ontological, epistemological, theoretical, methodological, and ethical choices for its purposeful application in EA research and practice.

5.2. Implications for Academics

The strengthening of EA's theoretical foundation is identified as a worthy endeavor since much of the effort so far has been in reinforcing the praxis than building the theoretical basis [4]. In this respect, the introduction of the HCA into EA theory is a novel contribution as far as our reading of the current state of the EA literature is concerned. It could be used to expand on the ecological school of EA with emphasis on the human-centered agenda [4].

This paper invites researchers to forcefully challenge the status quo in the interest of enshrining stakeholder values in EA design. The need for an expansive venture to apprehend stakeholder interests is emphasized. An aspect of EA theory that is drawing attention

is the drive towards holism and within it the question of putting EA on a sustainability pedestal. This conceptual paper would contribute towards the holistic treatment of EA. It would add to the growing call for assigning a prominent role to the social component of EA [4,115].

The HCA has rarely been applied in the corporate sector as much as in a public policy context. This has perhaps helped to accentuate its normative rationale more than its potential economic benefits to enterprises. In this paper, we attempted to show its potential in EA planning and evaluation, both in the business and public sectors. The paper will hopefully enrich the HCA literature as it explores new territories for the application of the theory.

Although there are efforts to investigate EA through the lens of economic, environmental, and social sustainability, we feel that there is room for improvement by attacking the problems of viability and sustainability from the perspective of the individual (the problem of *atomism*, in sociological parlance) [4,13,144]. The HCA considers the individual as the core element of analysis for social enterprise without the need to relegate social concerns [145].

Furthermore, consequent to the propositions presented in Section 4, the following research strands may need investigation.

- With the introduction of the HCA to EA theory, a new path of comprehensive research integrating normative ethics into EA is opened. As a preface, researchers may investigate the extent to which stakeholder interests drive current EA theory and practice.
- We argued that human capabilities expansion is the true goal of EA. A potential research strand that needs some empirical data is the extent to which EA efforts, by design, contribute to human capabilities expansion.
- Stakeholders pursue different goals that can often be in contradiction. It is therefore imperative to look for mechanisms, techniques, and tools for prioritizing and optimizing these stakeholders and their goals in enterprise architecting [117].
- We see a potential answer in human capabilities consciousness for the question posed by Bernus et al. [13] regarding what they call the *meaning of survival* in the context of EA. They argue, EA must define the values and principles that govern what and why needs to sustain. An in-depth inquiry into the problem (EA survival mode) and our potential solution domain (human capabilities) is suggested.

5.3. Implications for Practitioners

In this paper, we endorse the systems perspectives for understanding and diagnosing EA's positioning in organizations. Across all aspects of the EA, systems thinking should be infused for the successful implementation of EA projects. Particularly focusing on the purpose of a system is essential to understand the structures and interactions of the system [78].

A corollary to this implication is systems thinking shall inform the enterprise's sustainability drive. As Meadows and Wright [36] suggested, the overall purpose of enterprise management should not only be to manage for productivity or stability but also for sustainability and resilience. Though sustainability works at different levels, we presented the HCA as a theoretical framework to anchor sustainability at the level of the individual or of the group.

EA is a balancing act among the interests of competing, cooperating, and co-opting stakeholder interests. Stakeholder theory can be used in identifying stakeholders and choosing which stakeholders and what stakes matter [146]. For example, [87] proposed a theory of stakeholder identification and salience to organizations based on power, legitimacy, and urgency attributes. The role of the HCA would be to reorient the decision-making process to focus on what matters—the achievement of human functions. As [63] indicate, stakeholder capability enhancement can bring about cooperative and competitive advantages to stakeholders through achievement of their functionings.

Another implication of the propositions is that continuous learning is recommended to make sustainable change possible. Complex systems such as enterprises can only survive if they can cope with the socio-cultural changes in the environment. The transformation towards more differentiation means that EA should align with this paradigmatic shift. Enterprise architects should make agility their guiding principle in order to make continuous learning possible.

To reiterate what we have said in Section 4.4, the HCA could become an integral component of EA planning and evaluation frameworks. From determining missions, visions, and principles to selection of methods and technologies and evaluation of impacts, the HCA could inform EA practice and (re)direct organizational efforts towards realization of the organization's *telos*–human flourishing.

6. Conclusions

The motivation for this research was the felt need for a holistic integration of the technical and non-technical aspects of EA. In this paper, we have tried to show that the HCA can be used as an integrative framework in EA. We showed that human capabilities consciousness in EA is at its early stage though latest research outputs have indicated in the direction of holism. We emphasized the need for integration of different human oriented concepts as they relate to technological change. The culmination of the research were the four propositions made which form a logical chain, one leading to the next. Table 4 summarizes the propositions.

Table 4. Summary of propositions.

ID	Proposition	Explanation
Proposition-1	Enterprise architecture is socio-technical architecture.	The technical aspect of EA has been given much more emphasis than the social. We argue, the human component should come forward for a better understanding and realization of EA goals.
Proposition-2	Enterprise architecture is an instrument for promoting stakeholder values.	Stakeholders are usually treated as instruments for enterprise goals realization. We argue, stakeholders may have interests/values which they want to promote. EA, as a strategic tool, should be wielded not to suppress, but to promote, stakeholder needs.
Proposition-3	Social sustainability is a critical criterion in enterprise architecture design.	Enterprises have been given an exalted position to economic sustainability. The recognition that the enterprise needs to promote stakeholder values leads to the conclusion that social and environmental sustainability are equally important. The enterprise will be strategically better off by recognizing and working towards social and environmental sustainability.
Proposition-4	Promoting human capabilities is an ideal EA should promote.	In conclusion, EA should serve the purpose of promoting human capabilities. The very purpose of enterprises is to serve the higher goal of human *flourishing*.

The philosophical position that any human made system's purpose is to further the interest of humans is underscored. To this effect, EA should be understood as socio-technical architecture the purpose of which is to expand the choices of enterprise human stakeholders. We argued that, from a human-centric perspective, choice expansion is the fundamental utility provided by the enterprise.

From stakeholder theory, we gather that the enterprise is where a multitude of interests meet, negotiate, and optimize their goals. We agree with Nightingale and Rhodes [147] (4) when they say, "[e]nterprises exist to deliver value to stakeholders."

Human consciousness is in the ascendence in all human endeavors. EA should embrace this trend to stay relevant. This study, by providing a better understanding of human-capabilities in the context of EA, may help promote human-capabilities conscious practices. We argued that the conscious purpose—capability expansion—should define en-

terprise structures. We assert that capability expansion is a worthy endeavor the enterprise should work to achieve through EA.

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