"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Chapter Five

An Introduction to Enterprise Architecture in the Context of Technological Posthumanization[1]

Abstract. The discipline of enterprise architecture (EA) seeks to generate alignment between an organization's electronic information systems, human resources, business processes, workplace culture, mission and strategy, and external ecosystem in order to increase the organization's ability to manage complexity, resolve internal conflicts, and adapt proactively to environmental change. In this text, an introduction to the definition, history, organizational role, objectives, benefits, mechanics, and popular implementations of enterprise architecture is presented. The historical shift from IT-centric to business-centric definitions of EA is reviewed, along with the difference between 'hard' and 'soft' approaches to EA. The unique organizational role of EA is highlighted by comparing it with other management disciplines and practices.

The creation of alignment is explored as the core mechanism by which EA achieves advantageous effects. Different kinds of alignment are defined, the history of EA as a generator of alignment is investigated, and EA's relative effectiveness at creating different types of alignment is candidly assessed. Attention is given to the key dynamic by which alignment yields deeper integration of an organization's structures, processes, and systems, which in turn grants the organization greater agility – which itself enhances the organization's ability to implement rapid and strategically directed change. The types of tasks undertaken by enterprise architects are discussed, and a number of popular enterprise architecture frameworks are highlighted. A generic EA framework is then presented as a means of discussing elements such as architecture domains, building blocks, views, and landscapes that form the core of many EA frameworks. The role of modelling languages in documenting EA plans is also addressed.

In light of enterprise architecture's strengths as a tool for managing the deployment of innovative forms of IT, it is suggested that by adopting EA initiatives of the sort described here, organizations may better position themselves to address the new social, economic, and operational realities presented by emerging 'posthumanizing' technologies such as those relating to social robotics, nanorobotics, artificial life, genetic engineering, neuroprosthetic augmentation, and virtual reality.

[1] This text draws heavily on Part II B ("Fundamentals of Enterprise Architecture") of Gladden, "Enterprise Architecture for Neurocybernetically Augmented Organizational Systems" (2016).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

I. Introduction

The management discipline of enterprise architecture (EA) is characterized by its effort to engineer an enhanced 'alignment' between an organization's information systems, human resources, business processes, workplace culture, mission and strategy, and external ecosystem in order to strengthen the organization's ability to manage complexity, resolve internal conflicts, and adapt proactively to environmental change.

For small organizations – or those that are not especially dependent on sophisticated electronic information systems – the notion of employing the complex array of processes and tools offered by enterprise architecture may understandably appear both impractical and unnecessary; however, even small organizations can benefit from applying the basic principles of EA in a streamlined form. And for large organizations – and especially those whose competitive advantage depends on continually executing the rapid and successful adoption of innovative information technologies – EA in its fullest form can provide an essential management tool.

Enterprise architecture emerged in the 1980s and 1990s as a means for organizations to bring greater coherence, competence, and strategic direction to their acquisition and use of computing technologies. From those earliest days, EA has cultivated a unique insight into the challenges and opportunities to be found in the integration of transformative technologies into organizational life. Today, organizations are increasingly grappling with the strategic, operational, and tactical implications of a new wave of emerging technologies – such as those relating to social robotics, nanorobotics, artificial life, genetic engineering, neuroprosthetic augmentation, and virtual reality – that are creating a technologized and 'posthumanized' world in which human beings are no longer the only intelligent agents who gather information from the environment, make strategic decisions, and act to transform the world.[2] The adoption of thoughtful EA initiatives can enable organizations to creatively and efficiently incorporate into themselves the most beneficial aspects of such innovative posthumanizing technologies while minimizing the organizational risks that they pose. In this way, enterprise architecture can position organizations to survive, compete, and adapt within an increasingly complex world of intensively networked digital-physical ecosystems that are evolving

[2] For a discussion of processes of technologization and its role in the larger phenomenon of posthumanization, see, e.g., Herbrechter, *Posthumanism: A Critical Analysis* (2013); Ferrando, "Posthumanism, Transhumanism, Antihumanism, Metahumanism, and New Materialisms: Differences and Relations" (2013); and Gladden, *Sapient Circuits and Digitalized Flesh: The Organization as Locus of Technological Posthumanization* (2016).

with ever greater speed.[3] With these points in mind, the following sections provide an introduction to the definition, history, organizational role, objectives, benefits, mechanics, and popular implementations of enterprise architecture and present an overview of a generic enterprise architecture framework.

II. Definitions of Enterprise Architecture

Many management scholars and practitioners have formulated definitions of enterprise architecture. Although all definitions share similar elements, they possess nuances of emphasis that allow them to be divided into two broad groups of 'IT-centric' and 'business-centric' definitions.

IT-centric Definitions

'IT-centric' definitions of EA reflect the original vision of enterprise architecture as a discipline whose initial purpose was to aid organizations in designing and implementing IT systems. For example, Gammelgård et al. define enterprise architecture as "an established approach for the model-based and holistic management of IT,"[4] and Cane and McCarthy state that "Enterprise architecture frameworks provide a basis to systematically document and manage the information technology assets of an organization."[5] Similarly, Mezzanotte and Dehlinger contend that "Existing EA frameworks consider EA design solely from a techno-centric perspective focusing on the interaction of business goals, strategies, and technology." They argue that many EA programs fail as a result of this limiting and problematic focus on technological phenomena, which overlooks the social and human aspects that can make it impossible for key organizational stakeholders to effectively express what they wish to achieve from an enterprise architecture program.[6]

[3] Digital-physical ecosystems are discussed in numerous contexts, such as investigations of digital ecosystems, cyber-physical systems, virtual worlds, and the Internet of Things. For various perspectives on digital-physical ecosystems and their growing importance, see, e.g., Bainbridge, *The Virtual Future* (2011); Evans, "The Internet of Everything: How More Relevant and Valuable Connections Will Change the World" (2012); and *Digital Ecosystems: Society in the Digital Age*, edited by Jonak et al. (2016).

[4] Gammelgård et al., "An IT Management Assessment Framework: Evaluating Enterprise Architecture Scenarios" (2007).

[5] Cane & McCarthy, "Measuring the Impact of Enterprise Architecture" (2007).

[6] Mezzanotte & Dehlinger, "Enterprise Architecture: A Framework Based on Human Behavior Using the Theory of Structuration" (2012).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Business-centric Definitions

'Business-centric' definitions of enterprise architecture, on the other hand, reflect a newer and broader understanding of EA, emphasizing the discipline's role in shaping and optimizing an organization's structures, processes, and systems in order to best support the organization's business strategy. An example of such a definition is presented by Land et al.,[7] who after reviewing many established definitions of EA distill and synthesize those formulations to define enterprise architecture as:

> A coherent set of descriptions, covering a regulations-oriented, design-oriented and patterns-oriented perspective on an enterprise, which provides indicators and controls that enable the informed governance of the enterprise's evolution and success.

Such a definition does not make any specific reference to an organization's technological infrastructure or IT systems.

The Shift from IT-centric to Business-centric Approaches

Turner et al.[8] have charted the evolution of enterprise architecture from a field primarily concerned with IT management and dominated by technologists to a more mature and holistic discipline that informs and shapes strategic, operational, and tactical decision-making throughout an organization and which calls for enterprise architects to possess a broader range of experience and expertise than simply familiarity with IT management. Similarly, Bean acknowledges that the origins of enterprise architecture lay explicitly in IT management but explores ways in which the field has been extended to guide the engineering of all aspects of an organization, rather than merely its IT systems.[9] Nevertheless, the vision of enterprise architecture as a discipline that is not merely a robust form of IT management but instead a general managerial discipline whose proper object comprises all of an organization's components and activities is belied by the fact that, in practice, EA personnel typically report to an organization's chief information officer rather than to the chief strategy officer or CEO.[10]

---

[7] Land et al., "Positioning Enterprise Architecture" (2009).

[8] Turner et al., "Architecting the Firm – Coherency and Consistency in Managing the Enterprise" (2009).

[9] Bean, "Re-Thinking Enterprise Architecture Using Systems and Complexity Approaches" (2010).

[10] Lindström et al., "A Survey on CIO Concerns – Do Enterprise Architecture Frameworks Support Them?" (2006).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

'Hard' vs. 'Soft' Approaches to Enterprise Architecture

The distinction between IT-centric and business-centric definitions of enterprise architecture is also sometimes understood as a difference between 'hard' and 'soft' approaches to EA. Magoulas et al. classify elements of enterprise architecture frameworks as either 'hard' approaches that focus on the engineering of organizational IT systems or 'soft' approaches that focus primarily on the human aspects of implementing architectural changes and which resemble many of the techniques employed in more humanistic and 'anthropocentric' disciplines such as organizational design and, especially, organization development.[11]

Historically, enterprise architects have tended to focus on hard approaches. In particular, early practitioners of enterprise architecture largely underappreciated the value (and even necessity) of explicitly incorporating into their work 'soft' elements such as the political and cultural knowledge, interpersonal communication, leadership, and incentivization that are needed to reduce the doubts and resistance of stakeholders and successfully implement an enterprise architecture program within an organization.[12] However, even from the beginning, some EA frameworks (such as that developed by Xerox) have done a more effective job than others of incorporating complementary hard and soft aspects.[13] And over time, the field of EA management has broadened its focus to include such concerns – to the extent of even attempting to make enterprise architecture 'fun' for those stakeholders whom it impacts.[14]

Comparing Enterprise Architecture to Other Management Disciplines

Enterprise architecture is often confused with or assumed to be identical to a number of other management disciplines and techniques[15] that similarly involve the optimization of organizational components and dynamics, the

[11] Regarding the humanistic origins and nature of organization development, see Bradford & Burke, *Reinventing Organization Development* (2005), and Gladden, "Organization Development and the Robotic-Cybernetic-Human Workforce: Humanistic Values for a Posthuman Future?" (2016).

[12] Ahlemann et al., "People, Adoption and Introduction of EAM" (2012).

[13] See Magoulas et al., "Alignment in Enterprise Architecture: A Comparative Analysis of Four Architectural Approaches" (2012), p. 98, and its discussion of Howard, "The CEO as Organizational Architect: An Interview with Xerox's Paul Allaire" (1992).

[14] Ahlemann et al. (2012).

[15] See Stelzer, "Enterprise Architecture Principles: Literature Review and Research Directions" (2010).

administration of IT resources and processes, or the management of organizational change. Below we consider the relationship of EA to some of these practices.

Enterprise Architecture vs. Organizational Architecture

In its focus on creating 'alignment,' enterprise architecture shares many similarities with the field of organizational architecture that emerged at roughly the same time and which strives to generate a high degree of 'fit' or 'congruence' between an organization's components.[16] However, while enterprise architecture is rooted in the highly technical perspectives of IT management and its methodologies for installing and operating concrete hardware and software platforms, organizational architecture is grounded more broadly in philosophies of design, employing principles from the world of architecture in a more metaphorical and less literal fashion.

The disciplines of organizational architecture and enterprise architecture might be understood as mirror images or isomorphs of one another. Both attempt to design and implement an optimized target state for an entire organization; however, while organizational architecture sees the successful design of IT systems as one small component of overall organizational design, enterprise architecture tends to see designing an organization's broader strategies, personnel structures, and processes as one constituent task that must be performed in order to achieve the successful design and implementation of critical IT systems.[17]

Enterprise Architecture vs. Business Models

Iacob et al. suggest that an organization's enterprise architecture is linked to its business model, and thus changes to an organization's IT systems that affect an organization's EA will also affect its business model. In particular, they demonstrate how organizational IT changes reflected in the ArchiMate enterprise architecture model can be correlated with changes reflected in Osterwalder's Business Model Canvas.[18]

Enterprise Architecture vs. Service-Oriented Architecture (SOA)

Service-oriented architecture (SOA) – which "takes an architectural approach to designing and implementing IT solutions" – is best understood not

[16] See Nadler & Tushman, *Competing by Design: The Power of Organizational Architecture* (1997), and Hoogervorst, "Enterprise Architecture: Enabling Integration, Agility and Change" (2004), pp. 4-5.

[17] See, e.g., Rohloff, "Framework and Reference for Architecture Design" (2008), pp. 11-12.

[18] See Iacob et al., "From Enterprise Architecture to Business Models and Back" (2012), and Osterwalder & Pigneur, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers* (2010).

as an alternative to enterprise architecture but as a particular approach to managing the design and implementation of enterprise architectures.[19]

Enterprise Architecture vs. Management Cybernetics

Enterprise architecture can also be compared to management cybernetics and the Viable Systems Approach. Early iterations of management cybernetics (e.g., those of Stafford Beer) were explicitly developed by studying the processes of communication and control within intelligent biological organisms and developing general principles that could be applied to systems such as businesses and other organizations; however, more recent formulations of management cybernetics draw extensively on more generalized systems theory.[20]

Enterprise architecture is overwhelmingly a practical management discipline whose goal is to generate improved performance within real-world organizations in the immediate to near future. As such, EA frameworks implicitly incorporate a raft of assumptions about the nature and capacities of contemporary organizations, their human workforce, and their IT resources that may be valid in the present moment but which are not guaranteed to hold true in the future as human societies and technologies evolve. That does not typically pose a problem, insofar as EA is valued primarily for its practical value in enhancing the productivity of existing organizations and not for its theoretical insights or long-term predictive capacity. Management cybernetics, on the other hand, attempts to formulate more generalized principles regarding the behavior of organizations that are applicable not only to businesses as they exist today but to any types of organizations that might appear in the future. If enterprise architecture is understood primarily as a technology-oriented approach to managing contemporary organizations that is informed by various theories of organizational behavior, management cybernetics can conversely be understood largely as a theory of systems structure and dynamics that possesses useful applications for the management of organizations.[21]

---

[19] See MacLennan & Van Belle, "Factors Affecting the Organizational Adoption of Service-Oriented Architecture (SOA)" (2013).

[20] See, e.g., Beer, *Brain of the Firm* (1981); Barile et al., "An Introduction to the Viable Systems Approach and Its Contribution to Marketing" (2012); Pérez Ríos, "Systems Thinking, Organisational Cybernetics and the Viable System Model" (2012); and Gladden, "The Artificial Life-Form as Entrepreneur: Synthetic Organism-Enterprises and the Reconceptualization of Business" (2014).

[21] For a discussion of connections between EA and management cybernetics, see, e.g., Buckl et al., "A Viable System Perspective on Enterprise Architecture Management" (2009).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Enterprise Architecture as a Discipline, Process, or State

Caetano et al. explicitly use the phrase 'enterprise architecture' to describe the optimized target state that is designed for a particular organization by an enterprise architect. They thus explain that:

> An enterprise architecture is the result of the continuous process of representing, integrating and keeping consistently aligned the elements that are required for managing and understanding the organization.[22]

However, this is by no means the only way of conceptualizing enterprise architecture. The phrase 'enterprise architecture' can be used in at least four ways:

- To refer to the **discipline and body of knowledge** that describe (and seek to continually improve) the array of processes and techniques that constitute enterprise architecture.
- To refer to a **process** of enterprise architecture that is intentionally employed by a particular organization at a specific point in time in order to design and implement a new organizational state.
- To refer to the **optimized target state** that has been knowingly designed for a particular organization by an enterprise architect and which is detailed in an EA plan.[23]
- To refer to the ***de facto* arrangement** of an organization's components and dynamics at a particular point in time – i.e., the actual 'architecture' of that 'enterprise' – regardless of whether or not that state was intentionally designed by an enterprise architect.

If the phrase is employed in the final sense, it could be said that *every* functioning organization possesses an 'enterprise architecture,' even if it is inefficient and suboptimal and the organization has never intentionally employed the *process* of enterprise architecture. In this text, the phrase 'enterprise architecture' is used in all four senses, with the exact meaning depending on the context. Thus one might speak of "drawing on the principles of enterprise architecture to carry out a process of enterprise architecture that replaces an organization's current, suboptimal enterprise architecture with a new enterprise architecture that creates greater alignment."

Within the field's literature, the phrase 'enterprise architecture management' is often employed to specify the discipline of EA or the process of designing, implementing, and maintaining a particular EA within a given organization. Similarly, the phrase 'enterprise architecture framework' refers to a specific approach (often given a proper name and marketed by a particular

[22] Caetano et al., "A Role-Based Enterprise Architecture Framework" (2009), p. 253.
[23] See Iacob et al. (2012).

author or institution) to conducting an EA process and preparing the documents that depict an organization's target EA.

III. Goals and Benefits of Enterprise Architecture

Perhaps reflecting their origins in the world of IT management, the many EA frameworks in use today generally do a robust and rigorous job of defining technical tools and processes (such as UML-based schematics) for analyzing or designing an organization's enterprise architecture. However, there is a distinct lack of agreement regarding the goals that such activities are meant to achieve. Moreover, there is a lack of clarity regarding the success factors that contribute to a particular enterprise architecture effort being able to deliver beneficial results.[24]

A comprehensive analysis by Boucharas et al. suggests that EA is capable of delivering a hundred different benefits that are produced through the three key value-generating mechanisms of standards, models, and IS/IT governance frameworks.[25] However, individual frameworks often focus on generating a smaller number of more targeted benefits. A typical account is that presented by Magoulas et al., who assert that the goals of enterprise architecture include reducing an organization's complexity, increasing its changeability, and providing a clearer basis for evaluation, in order to enhance the organization's competitiveness.[26] Similarly, Rohloff[27] notes that the objectives of enterprise architecture include promoting an organization's effectiveness, efficiency, continuity and structural stability, ability to adapt to change, transparency in communication, and ability to plan and control activities in order to implement the organization's strategy and business model.

For the kinds of organizations (such as military agencies and departments) that are likely to be early deployers of posthumanizing technologies such as those used to neuroprosthetically enhance human personnel, we can identify at least three goals of enterprise architecture that are likely to be relevant; these are managing complexity, resolving internal conflicts, and generating integration, agility, and the ability to manage change. Below we consider these goals and benefits of enterprise architecture in more detail.

---

[24] Nakakawa & Proper, "Quality Enhancement in Creating Enterprise Architecture: Relevance of Academic Models in Practice" (2009).

[25] Boucharas et al., "The Contribution of Enterprise Architecture to the Achievement of Organizational Goals: A Review of the Evidence" (2010), pp. 6-7.

[26] Magoulas et al. (2012), p. 88.

[27] See Rohloff (2008).

Managing Complexity

Managing change and complexity are the two greatest challenges reported by contemporary business leaders, and the discipline of enterprise architecture has in large part been developed to aid organizations in confronting these challenges.[28] Enterprise architecture makes it easier for organizations to grapple with tremendous internal complexity by creating a conceptual framework that reduces such intricacies to a more manageable array of core components and dynamics whose behavior and interactions can be easily analyzed, predicted, and controlled.[29] Historically, enterprise architecture has been especially valuable in aiding organizations to deal with internal technological complexity: in many contemporary organizations, key processes of data analysis, decision-making, and control are supported or managed by ineffective and inefficient IT systems that comprise a vast and bewildering collection of hardware and software platforms – old and new, off-the-shelf and custom-built – that are held together by a makeshift jumble of mechanisms and interfaces.[30] EA can be employed to make sense of such environments.

Resolving Internal Conflicts

The implementation of a thoughtfully designed enterprise architecture can also aid in avoiding or resolving internal conflicts[31] such as differences in prioritizing organizational objectives; competing claims on organizational resources; or disagreements over the timing, scope, or tactics of organizational activities being planned.[32]

Generating Integration, Agility, and the Ability to Manage Change

Enterprise architecture seeks to optimize an organization's ability to successfully manage change by achieving a high degree of agility, which in turn results from effectively integrating the organization's components and behaviors. We can explore these dynamics in more detail.

Organizations Must Be Able to Implement Rapid and Directed Change

Phenomena such as the growing complexity and dynamism of business environments, intensive globalized competition, and increasingly fickle and knowledgeable consumers mean that a "traditional modus operandi based on command and control" no longer has the ability to generate and maintain a

[28] Højsgaard, "Market-Driven Enterprise Architecture" (2011).

[29] Rohloff (2008).

[30] Sundberg, "Building the Enterprise Architecture: A Bottom-Up Evolution?" (2007).

[31] See Fritz, *Corporate Tides* (1996), and its discussion in Hoogervorst (2004), pp. 4-5.

[32] In this way, EA supports the conflict-resolving role of 'System 2' as described in the Viable System Model formulated within management cybernetics. See, e.g., Pérez Ríos (2012).

competitive advantage for a contemporary business; in response to such environmental challenges, enterprise architecture seeks to provide a 'blueprint' that allows a business to better understand its internal structure, processes, and systems and to deftly and efficiently adjust those features as needed in order to achieve a desired future state.[33]

Indeed, an organization's ability to successfully design and implement a process of transformational change in order to allow it to execute its business strategies is arguably even more important than the development of particular strategies that possess high-quality content; a business with a highly adaptable and well-integrated architecture but suboptimal strategies might be expected to outperform one with good strategies but a brittle, inelastic, unresponsive, labyrinthine architecture.[34]

In Order to Change Rapidly, Organizational Agility Is Needed

Not all organizations are in a position to implement rapid and directed change on an ongoing basis. Hoogervorst notes that an ever-greater degree of organizational agility is needed in order for businesses to regularly introduce new kinds of goods and services and to modify their existing offerings with increasing frequency – activities that are required by the quickening pace of societal and industrial change.[35] However, large, complex, and technology-intensive enterprises face especially great challenges in generating and maintaining the degree of organizational agility that is needed in order to create and control such dynamic processes of change. Proactive steps must be taken in order to achieve such agility.

In Order to Develop Agility, Organizational Integration is Needed

Proponents of enterprise architecture argue that the best way to develop organizational agility is by achieving a high degree of organizational integration on both the functional and conceptual levels. Attempting to implement major changes in one element of an organization without first understanding all of that element's interdependencies with other parts of the organization can easily end in disaster.[36] If the changes taking place throughout a large organization are not consistent with one another, they risk pulling the organization away from its strategies or even tearing the organization apart. The more radical the change that an organization is attempting to implement, the

[33] Magoulas et al. (2012), p. 88.

[34] See Kaplan & Norton, *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment* (2001), and the discussion of that text in Hoogervorst (2004), pp. 4-5.

[35] Hoogervorst (2004), p. 5.

[36] Hoogervorst (2004), p. 2.

stronger and deeper the integration that the organization must possess.[37] An organization lacking such integration might be compared to an animal that lacks a central nervous system: although the body parts that constitute such an animal might change in response to environmental stimuli, the changes are not internally coordinated or purposefully directed by the organism.

Hoogervorst notes that as a business (or any other system) grows more 'extended' in its geographical scope, complexity and diversity of activities, number of internal subsystems, and range of interaction with its external ecosystem, it becomes more essential for the business to possess a single coherent architecture that can integrate all of the organization's components and processes and allow them to function seamlessly in unison with one another.[38] Similarly, Caetano et al. argue that in order to be able to adapt to change in an agile manner, an organization must possess an integrated representation that contains all relevant knowledge about its personnel, business processes, IT systems, and technology[39]; the process of enterprise architecture attempts to formulate such a knowledge representation for a particular organization and the system that it constitutes.

EA as Facilitator of an Ongoing Process of Change Management

To summarize, Hoogervorst argues that enterprise architecture has a threefold purpose: by creating a thorough *integration* of an organization's components and behaviors, EA gives the organization a high degree of *agility,* which allows the organization to *change* quickly and intelligently in order to adapt to rapidly evolving environmental conditions.[40] Likewise, Van der Raadt and Van Vliet emphasize the role of enterprise architecture in facilitating successful change management, noting that:

> Enterprise Architecture (EA) is an increasingly important instrument to better manage enterprise transformations. EA provides a means for getting insight into the current state landscape, creating a target blueprint, and setting out a roadmap to achieve that target state.[41]

Enterprise architecture not only supports the implementation of planned change; it also prepares organizations to better handle unplanned change.[42]

---

[37] Hoogervorst (2004), p. 17.

[38] Hoogervorst (2004), p. 4.

[39] Caetano et al. (2009).

[40] Hoogervorst (2004), p. 5.

[41] Van der Raadt & Van Vliet, "Assessing the Efficiency of the Enterprise Architecture Function" (2009).

[42] Hoogervorst (2004), p. 6; Kandjani et al., "Enterprise Architecture Cybernetics for Complex Global Software Development: Reducing the Complexity of Global Software Development Using Extended Axiomatic Design Theory" (2012).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

In this way, it positions contemporary organizations to continuously adapt in the face of disruptive new technologies, dynamic global markets, and rapidly evolving regulatory environments.[43]

IV. Creating Alignment: The Methodology of Enterprise Architecture

Regardless of which specific benefits an organization is seeking to obtain through the use of enterprise architecture, the means by which EA achieves those benefits is typically through the creation and maintenance of *alignment* within the organization. Within enterprise architecture, the notion of alignment has been used to refer to such diverse concepts as 'integration,' 'fusion,' 'compatibility,' 'harmony,' 'balance,' 'conformity,' and 'fit.'[44]

The History of Enterprise Architecture as a Generator of Alignment

The path toward the development of mechanisms for generating such alignment began in the 1980s, when many organizations made large investments in IT systems but were then surprised to discover that the systems did not generate the desired productivity benefits. Such failures often resulted from the fact that an organization's IT purchases were not adequately 'aligned' with its business needs and strategies:[45] often the IT systems provided business capacities that were not needed, failed to provide business capacities that *were* needed, could not be managed effectively by the organization's personnel, or otherwise could not be integrated successfully into the organization's existing business processes. The Strategic Alignment Model (SAM) was developed in the early 1990s by Henderson and Venkatraman to facilitate the alignment and integration of an organization's IT systems with its business processes and needs.[46]

Scholars later noted the challenges that arise when attempting to integrate IT systems and business strategy directly, given the fact that these are two very different spheres with different conceptual frameworks, vocabularies, objectives, and methodologies; various proposals were developed for formulating intermediary structures or disciplines that could serve as a neutral and effective interface between IT and business strategy.[47]

---

[43] Buckl et al., "A Situated Approach to Enterprise Architecture Management" (2010).

[44] Magoulas et al. (2012), pp. 92-93.

[45] Magoulas et al. (2012), p. 89; see also Hoogervorst (2004), p. 16.

[46] See Henderson & Venkatraman, "Strategic alignment: Leveraging information technology for transforming organizations" (1993), and Magoulas et al. (2012), p. 89.

[47] Magoulas et al. (2012), p. 89.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Types of Alignment

Chan and Reich[48] distinguish four kinds of alignment: strategic and intellectual, structural, social, and cultural. In principle, an effective EA framework should be capable of facilitating all four types of alignment. However, in practice EA frameworks focus primarily on creating strategic alignment between business and IT strategies, and the success or failure of an enterprise architecture's implementation is evaluated primarily on the basis of whether the architecture generates quantifiable 'extrinsic' gains in performance, not whether it yields 'intrinsic' cultural and social gains such as an enhanced understanding and acceptance of an organization's strategies by its workforce.[49]

Magoulas et al., meanwhile, identify five key kinds of alignment that can be generated by enterprise architecture: socio-cultural alignment (which creates harmonious relationships between information systems and the values, goals, and objectives of an organization's personnel), functional alignment (which creates harmonious relationships between information systems and an organization's activities and processes), structural alignment (which integrates information systems with the sites of power that serve as sources of authority and responsibility within an organization), infological alignment (which creates harmonious relationships between information systems and an organization's individual stakeholders), and contextual alignment (which creates harmonious relationships between an organization's information systems, the organization as a whole, and the external environment).[50]

EA's Ability to Create Different Types of Alignment

The analysis conducted by Magoulas et al.[51] has found that while a range of popular EA frameworks typically possess robust tools and guidance for creating functional, structural, and contextual alignment, they generally lack adequate (or even any) mechanisms or resources for creating infological or socio-cultural alignment; Magoulas et al. attribute this deficiency in part to the fact that some popular EA frameworks "presuppose that information resources should be treated as independent of organization and culture."[52] Such presuppositions underestimate the extent to which social and cultural factors impact every aspect of an organization's functioning, including elements as apparently 'impersonal' as IT systems.

---

[48] See Chan & Reich, "IT alignment: what have we learned?" (2007), and its discussion in Magoulas et al. (2012), p. 98.

[49] Magoulas et al. (2012), pp. 88-90.

[50] Magoulas et al. (2012), pp. 93-95.

[51] Magoulas et al. (2012), pp. 93-95, 98.

[52] Magoulas et al. (2012), p. 95.

How Enterprise Architects Engineer Alignment

Enterprise architecture utilizes explicit design principles to generate alignment and integration between domains such as those of *business*, *organization*, *information*, and *technology*.[53] Insofar as it seeks to intentionally design the form and functioning of such domains rather than to simply manage the behavior of existing structures, enterprise architecture requires a 'white-box' constructional perspective that understands all of the internal components and dynamics of such domains rather than a more limited 'black-box' functional perspective that is capable of manipulating the elements of these domains but not creating them.[54] Enterprise architects utilize their analytical and design skills in order to:

- Gather the vast quantities of data needed to map out the characteristics of an organization's current enterprise architecture.
- Identify missing elements, sources of conflict, and duplication of efforts within the current EA.
- Design a new EA that reflects an optimized 'target state' toward which the organization can move by means of change management processes.

In more mature organizations that have a track record of consciously employing the techniques of enterprise architecture, an enterprise architect's job may involve maintaining an EA that was designed at an earlier point in time, evaluating the ongoing effectiveness of that EA, and developing and implementing changes to the EA in response to internal or external change.

V. Popular Enterprise Architecture Frameworks

In their extensive review of EA frameworks, Magoulas et al. highlight the Zachman Framework, The Open Group Architecture Framework (TOGAF), the Extended Enterprise Architecture Framework (E2AF), and the Generalised Enterprise Reference Architecture and Methodology (GERAM) as leading examples of EA frameworks.[55] Meanwhile, Rohloff's comprehensive analysis of EA frameworks includes TOGAF, GERAM, and the Zachman Framework, as well as the Federal Enterprise Architecture Framework (FEAF), the Gartner and META Group Enterprise Architecture Frameworks, and the Siemens Framework that Rohloff formulates in his text.[56] Other EA frameworks

[53] Hoogervorst (2004), p. 18.
[54] Hoogervorst (2004), pp. 16-18.
[55] Magoulas et al. (2012), p. 88.
[56] Rohloff (2008), p. 3.

include those described in ISO 15704, ISO 19439, and ISO/IEC 15288.[57] Because different enterprise architecture frameworks all address the same underlying organizational dynamics (such as personnel structures and IT systems), it is generally possible to map one EA framework to another, regardless of how different their terminology or conceptual foundations might appear.[58]

VI. Key Elements of Enterprise Architecture: Presenting a Generic EA Framework

By analyzing the basic structures and dynamics that underlie a range of popular EA frameworks, it is possible for us to synthesize a high-level EA framework that provides a schematic overview of the types of elements commonly found in particular EA frameworks.[59] Such a generic EA framework is presented in the following sections; its key elements are constituent architectures (or domains), building blocks, views, and landscapes.[60] We can consider each of these in turn.

The Four Constituent Architectures or 'Domains'

The largest and most general features distinguished in an EA framework may be referred to as its constituent architectures or 'domains.' Our generic EA framework includes the four architecture domains of *business*, *organization*, *informatics*, and *infrastructure*.[61] The business architecture domain encompasses those elements that define the enterprise as a business that must

[57] See *ISO 15704:2000, Industrial automation systems – Requirements for enterprise-reference architectures and methodologies* (2000); *ISO 19439:2006, Enterprise integration – Framework for enterprise modelling* (2006); *ISO/IEC 15288:2002, Systems engineering – System life cycle processes* (2002); and Martin & Robertson, "A Comparison of Frameworks for Enterprise Architecture Modeling" (2003).

[58] For examples of such mappings, see Noran, "A Mapping of Individual Architecture Frameworks (GRAI, PERA, C4ISR, CIMOSA, ZACHMAN, ARIS) onto GERAM" (2003), and Williams & Li, "PERA and GERAM – Enterprise Reference Architectures in Enterprise Integration" (1999).

[59] Our generic framework draws on elements of EA frameworks such as TOGAF, FEAF, and, especially, the Siemens EA Framework described by Rohloff. See *TOGAF® Version 9.1* (2011); *Federal Enterprise Architecture Framework* (2013); and Rohloff (2008).

[60] These elements are commonly found across the broad range of EA frameworks; however, the vocabulary used to describe them in different frameworks varies in ways that can potentially create confusion. For example, Caetano et al. (2009) use the word 'view' to refer to what Rohloff (2008) and Hoogervorst (2004) call a 'domain'; Rohloff in turn uses the word 'view' to refer to what Caetano et al. might call a 'concept.' Nevertheless, as previously noted, it is generally easy to correlate such divergent sets of terminology, insofar as they address the same underlying enterprise structures and dynamics.

[61] TOGAF includes the four architectures of *business*, *data*, *applications*, and *technology*; see Part II (8) through Part II (12) of *TOGAF® Version 9.1* (2011). This can be compared, e.g., with the EA framework described by Hoogervorst (2004, p. 5), which includes the four domains of *business*,

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

secure resources from the environment, transform them into goods or services, and release those finished products into the environment to be acquired by consumers. The organization architecture domain encompasses those elements that define the structure and dynamics of the collection of intelligent social agents (who have historically been human beings but increasingly might instead include artificial agents) who undertake the enterprise under consideration. The informatics architecture domain encompasses all of an organization's information, the conceptual frameworks by which it organizes and classifies information, and the applications and processes (such as conventional software programs or artificial neural networks[62]) by which it manipulates information and makes it available to end users. The infrastructure architecture domain encompasses all of the physical IT systems and components that enable the execution of computing processes of all sorts; it also includes low-level electronic communication functions such as those described in the Open Systems Interconnection (OSI) model.[63]

The Building Blocks that Constitute Domains

In our framework, each of the four domains is in turn composed of three separate 'building blocks,' as depicted in Figure 1.[64] The business architecture

information, *organization*, and *technology;* with the EA framework formulated by Caetano et al. (2009, p. 254), which includes the four domains or 'concerns' of *organization*, *business*, *information*, and *system;* and with the Siemens EA Framework described by Rohloff (2008), which includes the three constituent architectures or 'domains' of *business*, *application*, and *infrastructure* that are tied together by an organization's *strategy*.

[62] A 'virtualized' neural network that is run as a software program on a conventional computer with a CPU-based Von Neumann architecture would be an application falling within the informatics architecture domain; a physical artificial neural network (such as one comprising an array of memristors) would constitute both a neural computing process falling within the informatics architecture domain as well as a physical IT system that falls within the infrastructure architecture domain. For a review of the standard Von Neumann architecture, see, e.g., Dumas, *Computer Architecture: Fundamentals and Principles of Computer Design* (2006). Regarding artificially intelligent systems that utilize physical ANNs, see, e.g., Snider, "Cortical Computing with Memristive Nanodevices" (2008); Versace & Chandler, "The Brain of a New Machine" (2010); *Advances in Neuromorphic Memristor Science and Applications*, edited by Kozma et al. (2012); and Lohn et al., "Memristors as Synapses in Artificial Neural Networks: Biomimicry Beyond Weight Change" (2014).

[63] See *ISO/IEC 7498-1:1994, Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model* (1994).

[64] For use of the term 'building blocks' to describe the elements of an enterprise architecture, see Parts I (2) and IV (37) of *TOGAF® Version 9.1* (2011), where building blocks may include such discrete elements as a single employee, business process, or software application. In the Siemens EA Framework described by Rohloff (2008), a 'building block' is a larger and more abstract element that is a constituent part of an architecture domain; each of the three domains is composed of four building blocks. The nature of the building blocks found in our generic EA framework is closer to Rohloff's usage, and there is some overlap between the building blocks defined in the

domain is constructed from the building blocks of: (1) an organization's *mission*, which represents the purpose for which the organization exists and provides the ultimate criterion by which it chooses which business avenues to pursue; (2) the *business model* that reflects the complex dynamics by which resources are transformed and products marketed in order to generate value for the organization; and (3) the *business processes* that are carried out in order to realize the dynamics represented by the business model.

The organization architecture domain is constructed from the building blocks of: (1) an *organization design* that defines intended roles, activities, and reporting relationships for all of an organization's human agents (or, potentially, artificial agents such as social robots or artificial general intelligences); (2) the *management practice* comprising the approaches by which managers actually direct activities on a daily basis[65] (and which may differ from the idealized management practices implicit in the organization design); and (3) the *organizational culture* that shapes and reflects workers' ethical standards, degree of motivation and commitment, and expectations for one another and which is only partly subject to the organization's centralized control.

The informatics architecture domain is constructed from the building blocks of: (1) the *information model* that provides a schema for identifying, capturing, and classifying all information relevant to the organization, such as that relating to business processes, products, physical resources, employees, suppliers, customers, and competitors; (2) *business applications* in the form of software that allows workers or artificial agents to perform business processes; and (3) *support applications* (such as generic web browsers or building automation system software that regulates a facility's heating and lighting) that are not designed or optimized to directly execute business processes but which facilitate other necessary activities.

Finally, the infrastructure architecture domain is constructed from the building blocks of: (1) *internal and external networks* that enable communication among all of the organization's stakeholders and systems and the gathering of intelligence from the external environment; (2) *servers and data storage systems* that enable the secure and efficient storage and retrieval of data; and (3) *productivity systems* including desktop and mobile systems that provide basic computing resources to workers as well as industrial systems that perform a specialized function.

---

two frameworks.

[65] Building on the classic management framework of Henri Fayol, Daft identifies the four essential functions that must be performed by a manager as *planning*, *organizing*, *leading*, and *controlling* the activities of those workers and systems that fall within the manager's purview. See Daft, *Management* (2011), p. 8.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

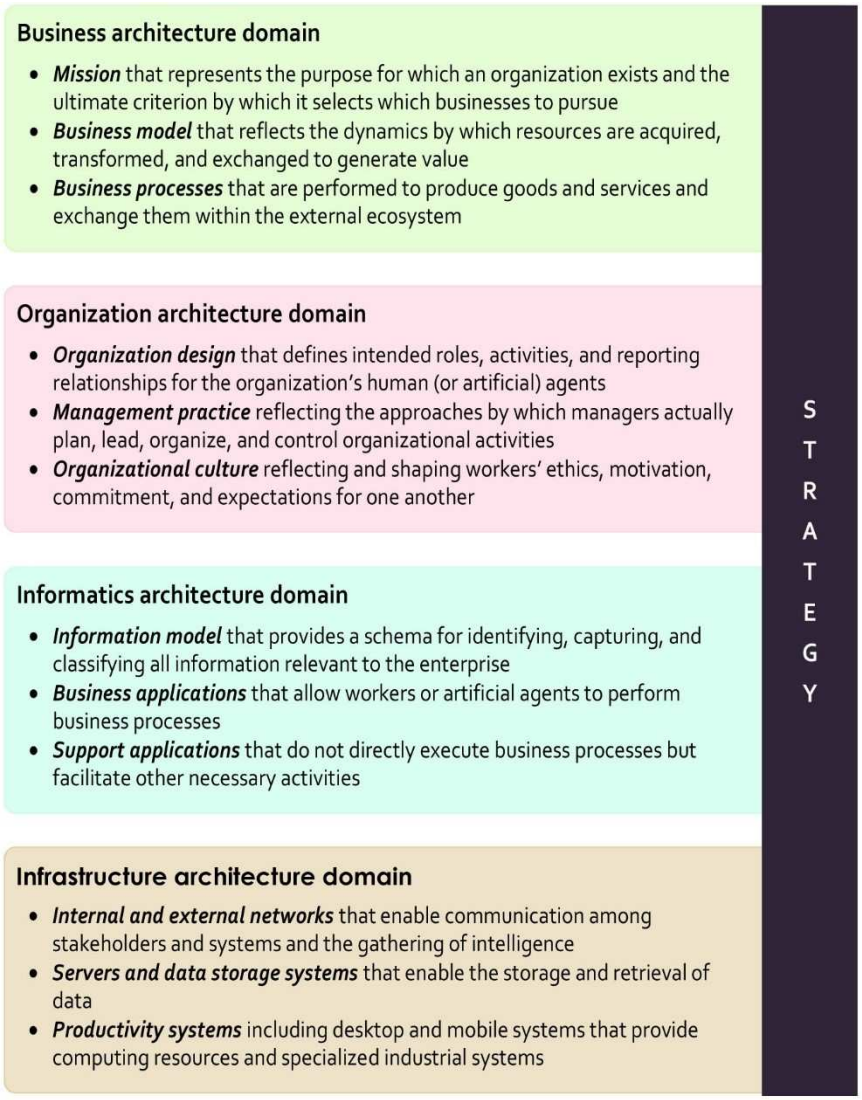

Fig. 1: A high-level schema for a generic enterprise architecture framework. Illustrated here are the four architecture 'domains' of business, organization, informatics, and infrastructure, along with the three 'building blocks' that constitute each domain and strategy as a unifying force that shapes all four domains. Different EA frameworks merge, subdivide, rename, and relate these basic elements in various ways.

Elements that Link or Transcend Domains

Researchers also identify various elements of EA frameworks that are said to link or transcend individual architecture domains. For example, Rohloff notes that the manifold interrelationships between the domains are themselves constituent elements of an enterprise architecture; he also contends that strategy and information security are elements that cannot be contained within a single domain but which instead link, infuse, and support all of the domains.[66] The Federal Enterprise Architecture Framework similarly depicts security as a concern that impacts and interconnects the five other domains (or 'reference models') of *performance*, *business*, *data*, *application*, and *infrastructure*.[67] Hoogervorst, on the other hand, is willing to localize information security more narrowly within the EA framework that he formulates, positioning InfoSec as a component of the element of 'quality' within the information architecture domain.[68]

Three Basic 'Views' for Describing Domains

It is possible to analyze an architecture domain from different perspectives, each of which reveals unique insights. For example, consider an employee of an organization's accounting department who is responsible for tracking the organization's acquisition and disposal of desktop computers so that he or she can perform annual asset depreciation calculations. That employee would conceptualize the organization's infrastructure architecture domain primarily in terms of information such as the quantity, purchase price, and serial numbers of desktop computers and their current location within the organization; he or she would have no particular interest in knowing the computers' performance characteristics or learning which business processes they facilitate. On the other hand, an employee of the organization's training and development department would analyze the same infrastructure architecture domain in terms of how workers might best be trained to successfully execute business processes using the types of computers possessed by the organization; he or she would not have a need to track the current state of repair or financial value of every particular computer. Both employees' perspectives on the infrastructure architecture domain are important and should be represented within an enterprise architecture plan; however, they are best captured using different lenses or 'views.'

The use of formalized 'views' as a means of analyzing architecture from different perspectives has been facilitated by the development of a number of models and standards. For example, the IEEE 1471 standard describes at an

[66] Rohloff (2008).
[67] *Federal Enterprise Architecture Framework* (2013), pp. 20-21.
[68] Hoogervorst (2004), p. 15.

abstract level the characteristics that architectural views should possess.[69] A particular array of views is defined by Kruchten's '4+1' model, which includes the *logical view* (employing the perspective of end-user functionality), *process view* (focusing on communication, integration, and other system behaviors and dynamics), *development view* (prepared from the perspective of the design, implementation, and management of software), and *physical view* (focusing on the deployment and interconnection of hardware components).[70] Similarly, the Siemens EA Framework described by Rohloff explicitly formulates three perspectives: the *component*, *communication*, and *distribution* views.[71] Meanwhile, The Open Group's ArchiMate modelling language for enterprise architecture defines eighteen standard 'viewpoints' or perspectives that can serve as the basis of views.[72]

For purposes of developing our generic EA framework, the streamlined approach taken by Kruchten and Siemens offers an appropriate guide. Our framework incorporates three primary perspectives on architecture domains: the *component*, *interaction*, and *membership* views.[73] The component view highlights all of the entities that together constitute the enterprise, including employees, physical facilities, computing devices, vehicles, products, and financial, material, and informational resources, as well as the capacities and internal processes that these entities possess. The interaction view highlights the network topology of the ways in which these entities are connected to

[69] See *ANSI/IEEE 1471-2000, IEEE Recommended Practice for Architectural Description for Software-Intensive Systems* (2000), later superseded by *ISO/IEC/IEEE 42010:2010, Systems and software engineering – Architecture description* (2011).

[70] See Kruchten, "The 4+1 view model of architecture" (1995).

[71] See Rohloff (2008), pp. 5-6.

[72] The eighteen standard 'viewpoints' defined by ArchiMate 2.1 are the *Introductory*, *Organization*, *Actor Co-operation*, *Business Function*, *Business Process*, *Business Process Co-operation*, *Product*, *Application Behavior*, *Application Co-operation*, *Application Structure*, *Application Usage*, *Infrastructure*, *Infrastructure Usage*, *Implementation and Deployment*, *Information Structure*, *Service Realization*, *Layered*, and *Landscape Map* viewpoints. See Section 8.4 of *ArchiMate® 2.1 Specification* (2013).

[73] Our component view is roughly analogous to Rohloff's component view and similar to Kruchten's physical view; our interaction view is similar to Rohloff's communication view and Kruchten's process view; and our membership view is comparable to Rohloff's distribution view and incorporates aspects of Kruchten's development and physical views. However, in contrast with Rohloff's model, we consider the 'relationships' among entities primarily as a part of their dynamic interaction rather than as static aspects of the components themselves (i.e., they are highlighted in the interaction rather than component view); we also suggest that VR technologies may be able to fashion stable and resilient virtual worlds that can be occupied by workers and other organizational elements rather than simply facilitating communication among organizational elements (i.e., worlds that can be fruitfully analyzed using the membership view rather than solely via the communication or interaction views). In contrast with Kruchten's model, we do not include a logical view dedicated to end-user functionality, insofar as our EA framework encompasses more diverse organizational elements than simply the software systems that Kruchten's model addresses.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

one another and the processes (such as those of communication and control) by which they interact. The membership view highlights the boundaries and occupants of those spatiotemporal regions (such as physical buildings, countries, time zones, or virtual environments) within which organizational elements are located or operate and of those functional or conceptual groupings (such as corporate departments or project teams) to which elements belong or to whose authority they are subject. Figure 2 presents a simplified schematic that demonstrates the ways in which different aspects of a hypothetical enterprise become apparent depending on whether one analyzes it using the component, interaction, or membership views.

Virtual Teams, Virtual Reality, and EA Views

Both the interaction and membership views highlight connections between workers, but in different ways. For example, two employees might work in the same building but have no interaction with one another, while two other employees may work at facilities in different countries but interact on a daily basis via email, telephone, and instant messaging as part of a virtual project team.[74] The emergence of new immersive virtual reality technologies adds a new dimension to membership views, as VR systems can be employed to create persistent multiuser environments in which human agents who are geographically dispersed in the 'real' world may inhabit a shared virtual world in which they interact with one another[75] – and perhaps also with virtual agents whose behavior may be governed by computers housed in yet other

[74] For more about such virtual teams, see Zofi, *A Manager's Guide to Virtual Teams* (2012), and Settle-Murphy, *Leading Effective Virtual Teams: Overcoming Time and Distance to Achieve Exceptional Results* (2012).

[75] In this context, what is commonly referred to as the 'real' world might more precisely be called the 'primary physical world,' to contrast it with 'secondary physical worlds' (or 'virtual' worlds). The contents of the primary physical world possess an objective existence and an underlying physical form that is isomorphic with the form in which the world is experienced by its human inhabitants. Secondary physical worlds are virtual worlds whose contents are determined by the computational processes of a computerized VR system; the contents of such virtual worlds are arbitrary, insofar as they are not constrained by the organization of the primary physical world (i.e., the shape of a virtual desk or virtual tree is determined by a digital file whose string of binary data does not in itself possess the 'shape' of a desk or a tree) and can be dramatically altered at will by a virtual world's human designer or world-management algorithms. However, even secondary physical worlds are still 'real' and 'physical' insofar as the organization of their contents is maintained within real physical objects (e.g., the hard drives or ROM chips of a VR computer system) and is experienced by their human inhabitants through the mediation of real physical stimuli (such as electrons or chemical neurotransmitters used to stimulate neurons in a host's sensory system or brain).

For the ramifications of long-term immersion in VR environments, see, e.g., Koltko-Rivera, "The potential societal impact of virtual reality" (2005), and Bainbridge (2011). Regarding psychological, social, and political questions arising from the repetitive long-term inhabitation of virtual worlds by means of a digital avatar, see, e.g., Castronova, "Theory of the Avatar" (2003).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

geographical regions or whose control processes are not geographically localizable.[76] An organization's elements might thus be grouped according to the virtual facilities, regions, or worlds within which they operate. A membership view designed to reflect the elements of an organization's virtual environments may require a complex multilayered representation: while a single employee typically inhabits just a single geographical region, he or she might simultaneously enjoy access to numerous virtual environments.

Landscapes: From Current to Target States

Many enterprise architecture approaches use a term such as 'blueprint' or 'landscape' to describe a document (or 'artifact') that depicts the relationships and dependencies that a single domain building block possesses with all of an enterprise's architecture domains, as analyzed according to multiple views.[77] Some researchers restrict use the term 'blueprint' to refer exclusively to a target architecture that is to be implemented in the future, employing a different term to refer to a document that describes a (potentially suboptimal) architecture that currently exists.[78]

Our generic EA framework facilitates the creation of similar types of landscapes. The landscape for a particular organizational element (such as an individual staff position, business process, smart building, or piece of enterprise software) can be developed by starting with a blank template of the sort shown in Figure 3 and filling in the various fields to reflect the ways in which the element being considered relates to the other elements of all four architecture domains when analyzed through the component, interaction, and membership views.

---

[76] Regarding the participation of artificial agent in virtual teams, see, e.g., Gladden, "Leveraging the Cross-Cultural Capacities of Artificial Agents as Leaders of Human Virtual Teams" (2014). For the possibility of networked artificial agents whose structure and behaviors cannot be traced or assigned to a particular physical location, see Gladden, "The Diffuse Intelligent Other: An Ontology of Nonlocalizable Robots as Moral and Legal Actors" (2016).

[77] For example, in the Siemens EA Framework presented by Rohloff, three commonly used blueprints or landscapes are the *application landscape* (which highlights the ways in which a particular business process is supported by various applications), *data repository landscape* (which illustrates the ways in which databases are deployed to create 'information clusters' within the organization's information architecture), and *service landscape* (which depicts the ways in which infrastructure services are deployed to support the organization's applications). See Rohloff (2008). TOGAF, on the other hand, uses the term 'Architecture Landscape' to refer to an organized collection of the diverse assortment of architectures at use within an organization at any given moment; see Part III (20) of *TOGAF 9.1* (2011).

[78] See, e.g., Bischoff et al., "Use It or Lose It? The Role of Pressure for Use and Utility of Enterprise Architecture Artifacts" (2014), which uses the term 'blueprint' to describe a target architecture and 'literature' to refer to artifacts that documenting an existing architecture.

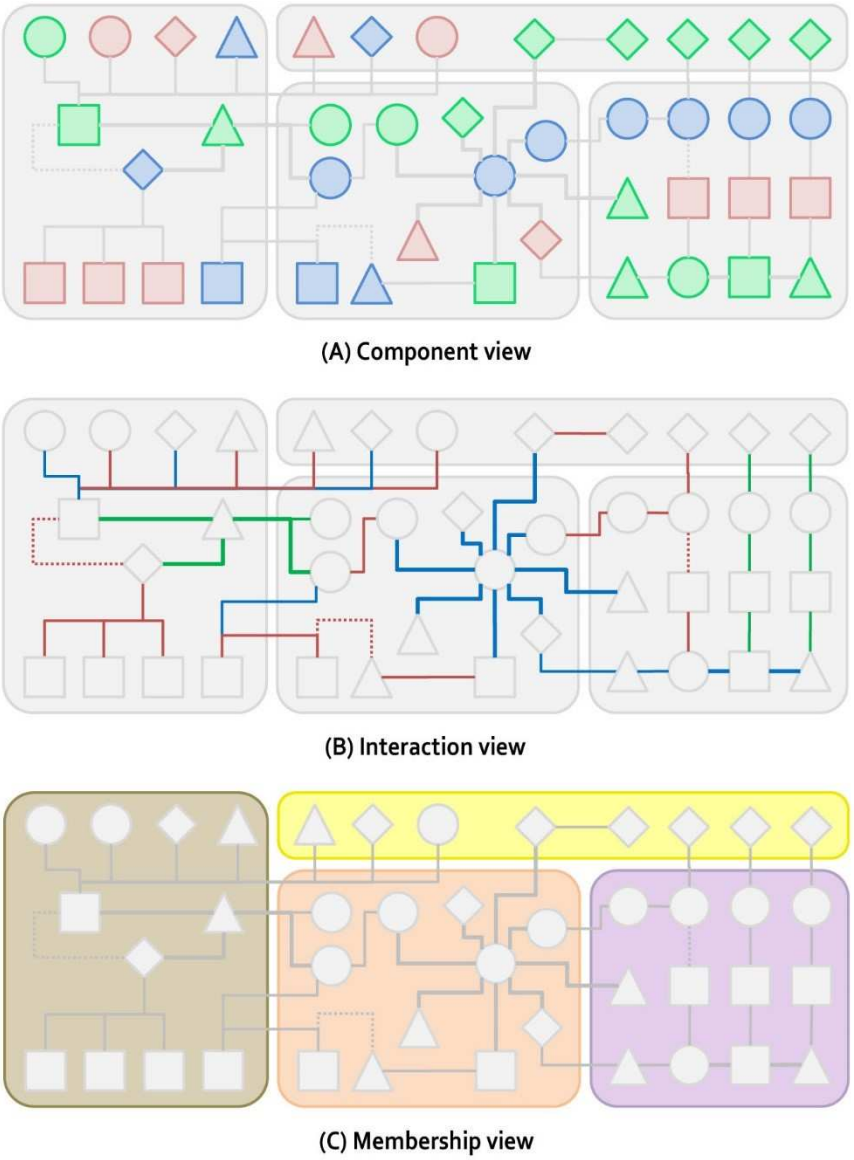

Fig. 2: A generic depiction of the role of different 'views' in an EA framework. Illustrated here are the structure and dynamics of a single enterprise as analyzed according to three views. The (A) component view highlights the entities and objects that constitute the organization; the (B) interaction view highlights the network topologies and processes of interaction between those entities; and the (C) membership view highlights the way in which the components operate and interactions occur within regions determined by spatiotemporal, functional, or conceptual boundaries.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Fig. 3: A generic template for creating an enterprise architecture 'landscape' or 'blueprint.' A particular organizational element (such as a specific business process or IT system) is chosen as the focus, and its relationship to the building blocks and domains is analyzed via the component, interaction, and membership views. Depending on the element chosen, some (less relevant) fields may be omitted or considered only generally, while (more relevant) others will be expanded into detailed sub-diagrams.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

A common EA practice is to first prepare a landscape showing how, for example, a particular piece of scheduling software is currently being used within the organization; in the process of preparing the landscape, an enterprise architect might discover that one corporate division is utilizing the software to great advantage while other divisions that could potentially benefit from use of the software are underutilizing it or are not even aware of its existence. Alternatively, the enterprise architect might realize that the software is inadequate and should likely be replaced, by observing the fact that superior alternative software is already being used to greater effect within other parts of the organization. The work of preparing the landscape might also highlight business processes that are currently performed manually throughout the organization but which the scheduling software could easily automate for increased efficiency, or it might reveal ways in which the scheduling software is being used in an *ad hoc* and unsecure manner to handle business processes for which it was never intended.[79] Once a landscape has been prepared that documents the ways in which such an organizational element is currently being used, a new target landscape (or 'blueprint') can be designed that depicts an improved state of affairs in which the element is used more efficiently, securely, and productively to advance the organization's strategy and mission. A change management process can then be designed and implemented to move the element from its current state to its target state.

The landscape template shown in Figure 3 contains 36 fields to be taken into consideration; however, it is not necessary (or, typically, appropriate) to dedicate equal attention to all of the fields. EA frameworks should be freely adapted to suit the circumstances at hand; they are meant to provide a useful tool, not to create a burden.[80] Thus, depending on the organizational element that is the chosen focus of the landscape, an enterprise architect might reasonably decide to consider some of the fields only very generally or to omit them altogether – while other fields may be so significant that it is necessary to address them in detail, perhaps even expanding them to create new subdiagrams or additional documents. While detailed landscapes may be necessary for frontline personnel who implement or manage technological systems, blueprints displaying a greater degree of abstraction may be especially useful for explaining a target architecture to organizational stakeholders such

[79] The use of landscapes for, e.g., identifying systemic deficiencies or redundancies in which business processes are supported by either an insufficient number or superfluity of applications is discussed in Rohloff (2008), p. 10.

[80] The importance of adapting an EA framework to the unique needs and circumstances of the organization employing it is discussed in Haki et al., "Beyond EA Frameworks: Towards an Understanding of the Adoption of Enterprise Architecture Management" (2012), and Magoulas et al. (2012), pp. 90-91.

as senior executives who require a high-level overview of the architecture but do not need access to all of its underlying details.[81]

Standards and Modelling Languages for EA Notation

Enterprise architecture facilitates the implementation of standards across an organization's architectural building blocks, allowing greater interoperability and ease of communication between systems.[82] Modelling languages such as ArchiMate and UML are often employed as visualization and notation systems to aid in the implementation of such standards.[83] However, while UML is well-suited for some architecture-related tasks such as the deployment of new software systems, its conceptual and terminological focus on information technology means that UML is – at least in its raw form – not appropriate for notating enterprise architecture, which involves a much broader range of organizational components and phenomena, not all of which can be understood as providing a 'service' to end users in the way that software does.[84] Even a language like ArchiMate that has been optimized for use in enterprise architecture cannot easily represent 'soft' building blocks such as organizational culture or the leadership aspect of management practice, which are critical for the success of an EA plan.[85]

VII. Conclusion

As we have explored in this text, the discipline of enterprise architecture is defined by its effort to engineer alignment between an organization's information systems, human resources, business processes, workplace culture, mission and strategy, and external ecosystem in order to enhance the organization's ability to manage complexity, resolve internal conflicts, and adapt proactively to environmental change.

The field of enterprise architecture is a rich (and potentially bewildering) one: while EA's original IT-centric focus has generally evolved to take on a broader business-centric outlook, contrasting 'hard' and 'soft' approaches to EA exist and are reflected in many competing EA frameworks. What all EA frameworks share is a commitment to the creation of alignment as the core

[81] See Van der Torre et al., "Landscape Maps for Enterprise Architectures" (2006).

[82] Rohloff (2008), p. 6.

[83] See Caetano et al. (2009), p. 253, and *ArchiMate® 2.1 Specification* (2013).

[84] Rohloff (2008), p. 6.

[85] The importance of psychological, social, and cultural factors for successful EA implementation is discussed, e.g., in Magoulas et al. (2012); Weiss & Winter, "Development of Measurement Items for the Institutionalization of Enterprise Architecture Management in Organizations" (2012); and Stephan Aier, "The Role of Organizational Culture for Grounding, Management, Guidance and Effectiveness of Enterprise Architecture Principles" (2014).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

mechanism for fashioning a deeper integration of an organization's structures, processes, and systems – which provides the organization with greater agility, which in turn strengthens the organization's ability to implement rapid and strategically directed change.

While enterprise architecture cannot by itself provide clear direction and objectives for an organization, it can beneficially complement, coordinate, and bring additional rigor to the work of other management disciplines such as strategic planning, organizational architecture, organization development, management cybernetics, and the development of business models. Moreover, EA's unique historical grounding in the field of information technology will render the discipline even more critical to businesses' success, as organizations increasingly grapple with the potential – and challenge – of harnessing emerging posthumanizing technologies such as those relating to social robotics, nanorobotics, artificial life, genetic engineering, neuroprosthetic augmentation, and virtual reality. Through the development and implementation of thoughtful enterprise architecture initiatives, organizations may better position themselves to encounter, withstand, and – where appropriate – exploit such dynamics of technologization and posthumanization that promise to transform the complex digital-physical ecosystems within which all contemporary organizations dwell.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

References

Ablett, Ruth, Shelly Park, Ehud Sharlin, Jörg Denzinger, and Frank Maurer. "A Robotic Colleague for Facilitating Collaborative Software Development." *Proceedings of Computer Supported Cooperative Work (CSCW 2006)*. ACM, 2006.

Adaptive Networks: Theory, Models and Applications, edited by Thilo Gross and Hiroki Sayama. Springer Berlin Heidelberg, 2009.

Advances in Neuromorphic Memristor Science and Applications, edited by Robert Kozma, Robinson E. Pino, and Giovanni E. Pazienza. Dordrecht: Springer Science+Business Media, 2012.

Ahlemann, Frederik, Eric Stettiner, Marcus Messerschmidt, Christine Legner, Kunal Mohan, and Daniel Schäfczuk. "People, adoption and introduction of EAM." In *Strategic Enterprise Architecture Management*, pp. 229-263. Springer Berlin Heidelberg, 2012.

Aier, Stephan. "The Role of Organizational Culture for Grounding, Management, Guidance and Effectiveness of Enterprise Architecture Principles." *Information Systems and E-Business Management* 12, no. 1 (2014): 43-70.

Alumur, Sibel, and Bahar Y. Kara. "Network hub location problems: The state of the art." *European journal of operational research* 190, no. 1 (2008): 1-21.

Amputation, Prosthetic Use, and Phantom Limb Pain: An Interdisciplinary Perspective, edited by Craig Murray. New York: Springer Science+Business Media, 2010.

Andersen, Peter A., and Janis F. Andersen. "Measures of Perceived Nonverbal Immediacy." In *The Sourcebook of Nonverbal Measures: Going Beyond Words*, edited by Valerie Manusov. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 2005.

Anderson, Walter Truett. "Augmentation, symbiosis, transcendence: technology and the future(s) of human identity." *Futures* 35, no. 5 (2003): 535-46.

Anderson, Michael L. "Embodied cognition: A field guide." *Artificial intelligence* 149, no. 1 (2003): 91-130.

Andrew, Alex M. "The decade of the brain: further thoughts." *Kybernetes* 26, no. 3 (1997): 255-264.

Ankarali, Z.E., Q.H. Abbasi, A.F. Demir, E. Serpedin, K. Qaraqe, and H. Arslan. "A Comparative Review on the Wireless Implantable Medical Devices Privacy and Security." In *2014 EAI 4th International Conference on Wireless Mobile Communication and Healthcare (Mobihealth)*, 246-49, 2014. doi:10.1109/MOBIHEALTH.2014.7015957.

ANSI/IEEE 1471-2000, IEEE Recommended Practice for Architectural Description for Software-Intensive Systems. IEEE Computer Society, 2000.

ArchiMate® 2.1 Specification. Berkshire: The Open Group, 2013.

Ariely, D., and G.S. Berns. "Neuromarketing: The Hope and Hype of Neuroimaging in Business." *Nature Reviews Neuroscience* 11, no. 4 (2010): 284-92.

Austerberry, David. *Digital Asset Management*. Second edition. Burlington, MA: Focal Press, 2013.

Ayaz, Hasan, Patricia A. Shewokis, Scott Bunce, Maria Schultheis, and Banu Onaral. "Assessment of Cognitive Neural Correlates for a Functional Near Infrared-Based Brain Computer Interface System." In *Foundations of Augmented Cognition. Neuroergonomics and Operational Neuroscience*, edited by Dylan D. Schmorrow, Ivy V. Estabrooke, and Marc Grootjen, 699-708. Lecture Notes in Computer Science 5638. Springer Berlin Heidelberg, 2009.

Baars, Bernard J. *In the Theater of Consciousness.* New York, NY: Oxford University Press, 1997.

Baddeley, Alan. "The episodic buffer: a new component of working memory?" *Trends in cognitive sciences* 4, no. 11 (2000): 417-23.

Baddeley, Alan. "Working memory: theories, models, and controversies." *Annual review of psychology* 63 (2012): 1-29.

Bainbridge, William Sims. *The Virtual Future*. London: Springer, 2011.

Băjenescu, Titu-Marius, and Marius I. Bâzu. *Reliability of Electronic Components: A Practical Guide to Electronic Systems Manufacturing*. Springer Berlin Heidelberg, 1999.

Baranyi, Péter, Adam Csapo, and Gyula Sallai. "Synergies Between CogInfoCom and Other Fields." In *Cognitive Infocommunications (CogInfoCom).* Springer International Publishing, 2015.

Barfield, Woodrow. *Cyber-Humans: Our Future with Machines.* Springer Science+Business Media, 2015.

Barile, S., J. Pels, F. Polese, and M. Saviano. "An Introduction to the Viable Systems Approach and Its Contribution to Marketing." *Journal of Business Market Management* 5(2) (2012): 54-78.

Bean, Sally. "Re-Thinking Enterprise Architecture Using Systems and Complexity Approaches." *Journal of Enterprise Architecture* 6, no. 4 (2010).

Beer, Stafford. *Brain of the Firm*. Second edition. New York: John Wiley, 1981.

Bekey, G.A. *Autonomous Robots: From Biological Inspiration to Implementation and Control*. Cambridge, MA: MIT Press, 2005.

Bendle, Mervyn F. "Teleportation, cyborgs and the posthuman ideology." *Social Semiotics* 12, no. 1 (2002): 45-62.

Bergey, John, Stephen Blanchette, Jr., Paul Clements, Mike Gagliardi, John Klein, Rob Wojcik, and Bill Wood. "U.S. Army Workshop on Exploring Enterprise, System of Systems, System, and Software Architectures." Technical Report CMU/SEI-2009-TR-008 / ESC-TR-2009-008. Hanscom AFB, MA: Software Engineering Institute, 2009.

Berner, Georg. *Management in 20XX: What Will Be Important in the Future – A Holistic View*. Erlangen: Publicis Corporate Publishing, 2004.

Bhunia, Swarup, Abhishek Basak, Seetharam Narasimhan, and Maryam Sadat Hashemian. "Ultralow Power and Robust On-Chip Digital Signal Processing for Closed-Loop Neuro-Prosthesis." In *Implantable Bioelectronics: Devices, Materials, and Applications*, edited by Evgeny Katz. Weinheim: Wiley-VCH, 2014.

Birnbacher, Dieter. "Posthumanity, Transhumanism and Human Nature." In *Medical Enhancement and Posthumanity*, edited by Bert Gordijn and Ruth Chadwick, pp. 95-106. The International Library of Ethics, Law and Technology 2. Springer Netherlands, 2008.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Bischoff, Stefan, Stephan Aier, and Robert Winter. "Use It or Lose It? The Role of Pressure for Use and Utility of Enterprise Architecture Artifacts." In *2014 IEEE 16th Conference on Business Informatics*, vol. 2, pp. 133-140. IEEE, 2014.

Black, Michael J., Elie Bienenstock, John P. Donoghue, Mijail Serruya, Wei Wu, and Yun Gao. "Connecting brains with machines: the neural control of 2D cursor movement." In *Proceedings of the 1st International IEEE/EMBS Conference on Neural Engineering*, pp. 580-83, 2003.

Blank, S. Catrin, Sophie K. Scott, Kevin Murphy, Elizabeth Warburton, and Richard JS Wise. "Speech production: Wernicke, Broca and beyond." *Brain* 125, no. 8 (2002): 1829-38.

Bogue, Robert. "Brain-Computer Interfaces: Control by Thought." *Industrial Robot: An International Journal* 37, no. 2 (2010): 126-32.

Boly, Melanie, Anil K. Seth, Melanie Wilke, Paul Ingmundson, Bernard Baars, Steven Laureys, David B. Edelman, and Naotsugu Tsuchiya. "Consciousness in humans and non-human animals: recent advances and future directions." *Frontiers in Psychology* 4 (2013).

Bonaci, T., R. Calo, and H. Chizeck. "App Stores for the Brain." *IEEE Technology and Society Magazine,* 1932-4529/15 (2015): 32-39.

Borkar, Shekhar. "Designing reliable systems from unreliable components: the challenges of transistor variability and degradation." *Micro, IEEE* 25, no. 6 (2005): 10-16.

Bostrom, Nick. "Human Genetic Enhancements: A Transhumanist Perspective." In *Arguing About Bioethics*, edited by Stephen Holland, pp. 105-15. New York: Routledge, 2012.

Bostrom, Nick, and Anders Sandberg. "Cognitive Enhancement: Methods, Ethics, Regulatory Challenges." *Science and Engineering Ethics* 15, no. 3 (2009): 311-41.

Boucharas, Vasilis, Marlies van Steenbergen, Slinger Jansen, and Sjaak Brinkkemper. "The Contribution of Enterprise Architecture to the Achievement of Organizational Goals: A Review of the Evidence." In *Trends in Enterprise Architecture Research*, 1-15. Springer, 2010.

Braddon-Mitchell, David, and John Fitzpatrick. "Explanation and the Language of Thought." *Synthese* 83, no. 1 (April 1, 1990): 3-29.

Bradford, David L., and W. Warner Burke. *Reinventing Organization Development: New Approaches to Change in Organizations*. John Wiley & Sons, 2005.

Brain-Computer Interfaces: Principles and Practice, edited by Jonathan R. Wolpaw and Elizabeth Winter Wolpaw. New York: Oxford University Press, 2012.

Brandt, Thomas. *Vertigo: Its Multisensory Syndromes*. Springer Verlag London, 2003.

Breazeal, Cynthia. "Toward sociable robots." *Robotics and Autonomous Systems* 42 (2003): 167-75.

"Bridging the Bio-Electronic Divide." Defense Advanced Research Projects Agency, January 19, 2016. http://www.darpa.mil/news-events/2015-01-19. Accessed May 6, 2016.

Brunner, Peter, and Gerwin Schalk. "Brain-Computer Interaction." In *Foundations of Augmented Cognition. Neuroergonomics and Operational Neuroscience*, edited by Dylan D. Schmorrow, Ivy V. Estabrooke, and Marc Grootjen, 719-23. Lecture Notes in Computer Science 5638. Springer Berlin Heidelberg, 2009.

Brunner, P., L. Bianchi, C. Guger, F. Cincotti, and G. Schalk. "Current Trends in Hardware and Software for Brain-Computer Interfaces (BCIs)." *Journal of Neural Engineering* 8, no. 2 (2011): 25001.

Bublitz, J.C. "If Man's True Palace Is His Mind, What Is Its Adequate Protection? On a Right to Mental Self-Determination and Limits of Interventions into Other Minds." In *Technologies on the Stand: Legal and Ethical Questions in Neuroscience and Robotics*, edited by B. Van Den Berg and L. Klaming. Nijmegen: Wolf Legal Publishers, 2011.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Buckl, Sabine, Christian M. Schweda, and Florian Matthes. "A Situated Approach to Enterprise Architecture Management." In *2010 IEEE International Conference on Systems, Man and Cybernetics*, 587-92. IEEE, 2010.

Buckl, Sabine, Florian Matthes, and Christian M. Schweda. "A Viable System Perspective on Enterprise Architecture Management." In *IEEE International Conference on Systems, Man and Cybernetics, 2009. SMC 2009*, 1483-88. IEEE, 2009.

Butler, Jesse. *Rethinking Introspection*. Palgrave Macmillan UK, 2013.

C4ISR Architecture Framework Version 2.0. C4ISR Architecture Working Group (AWG), US Department of Defense, December 18, 1997. http://www.afcea.org/education/courses/arch-fwk2.pdf. Accessed December 4, 2016.

Cadle, James, Debra Paul, and Paul Turner. *Business Analysis Techniques: 72 Essential Tools for Success.* Swindon: British Informatics Society Limited, 2010.

Caetano, Artur, António Rito Silva, and José Tribolet. "A Role-Based Enterprise Architecture Framework." In *Proceedings of the 2009 ACM Symposium on Applied Computing*, pp. 253-58. ACM, 2009.

Cahill, Larry, and Michael T. Alkire. "Epinephrine enhancement of human memory consolidation: interaction with arousal at encoding." *Neurobiology of learning and memory* 79, no. 2 (2003): 194-98.

Callaghan, Vic. "Micro-Futures." Presentation at Creative-Science 2014, Shanghai, China, July 1, 2014.

Calverley, D.J. "Imagining a non-biological machine as a legal person." *AI & SOCIETY* 22, no. 4 (2008): 523-37.

Cameron, Oliver G. *Visceral Sensory Neuroscience: Interoception.* Oxford University Press, 2001.

Campbell, Lyle. *Historical Linguistics.* Third edition. The MIT Press, 2013.

Cane, Sheila, and Richard McCarthy. "Measuring the Impact of Enterprise Architecture." *Issues in Information Systems* 8, no. 2 (2007): 437-42.

Castronova, Edward. "Theory of the Avatar." CESifo Working Paper No. 863, February 2003. http://www.cesifo.de/pls/guestci/download/CESifo+Working+Papers+2003/CESifo+Working+Papers+February+2003+/cesifo_wp863.pdf. Accessed January 25, 2016.

Cervera-Paz, Francisco Javier, and M. J. Manrique. "Auditory Brainstem Implants: Past, Present and Future Prospects." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, 437-42. Acta Neurochirurgica Supplements 97/2. Springer Vienna, 2007.

Chafe, Chris, and Sile O'Modhrain. "Musical muscle memory and the haptic display of performance nuance." In *Proceedings of the 1996 International Computer Music Conference*, pp. 1-4. Stanford: Stanford University, 1996.

Chan, Yolande E., and Blaize Horner Reich. "IT alignment: what have we learned?" *Journal of Information technology* 22, no. 4 (2007): 297-315.

Chang, Chia-Ke, Yu-Jung Li, and Chih-Cheng Lu. "RFID applied in recognition and identification for dental prostheses." In *Computerized Healthcare (ICCH), 2012 International Conference on*, pp. 43-45. IEEE, 2012.

Christen, Markus, and Sabine Müller. "Current status and future challenges of deep brain stimulation in Switzerland." *Swiss Medical Weekly* (2012): 142:w13570. doi:10.4414/smw.2012.13570.

"Chronic Pain and Spinal Cord Stimulation (SCS): Frequently Asked Questions." Boston Scientific, 2013. http://www.pae-eu.eu/wp-content/uploads/2015/03/NM-135814-AA-INTL-Spectra-Backgrounder_Final.pdf. Accessed December 8, 2016.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Church, George M., Yuan Gao, and Sriram Kosuri. "Next-generation digital information storage in DNA." *Science* 337, no. 6102 (2012): 1628.

Clancy, Frank. "At Military's Behest, Darpa Uses Neuroscience to Harness Brain Power." *Neurology Today* 6, no. 2 (2006): 4-8.

Clark, S.S., and K. Fu. "Recent Results in Computer Security for Medical Devices." In *Wireless Mobile Communication and Healthcare*, edited by K.S. Nikita, J.C. Lin, D.I. Fotiadis, and M.-T. Arredondo Waldmeyer, pp. 111-18. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 83. Springer Berlin Heidelberg, 2012.

Clark, Andy. "Systematicity, structured representations and cognitive architecture: A reply to Fodor and Pylyshyn." In *Connectionism and the Philosophy of Mind*, pp. 198-218. Springer Netherlands, 1991.

Clark, Andy. *Natural-born cyborgs: Minds, Technologies, and the Future of Human Intelligence*. Oxford: Oxford University Press, 2004.

Clarke, Arthur C. "Hazards of Prophecy: The Failure of Imagination." In *Profiles of the Future: An Inquiry into the Limits of the Possible,* revised edition. Harper & Row, New York, 1973.

Clausen, J. "Conceptual and Ethical Issues with Brain–hardware Interfaces." *Current Opinion in Psychiatry* 24, no. 6 (2011): 495-501.

Claussen, Jens Christian, and Ulrich G. Hofmann. "Sleep, Neuroengineering and Dynamics." *Cognitive Neurodynamics* 6, no. 3 (May 27, 2012): 211-14.

A Clinical Guide to Transcranial Magnetic Stimulation, edited by Paul E. Holtzheimer and William McDonald. New York: Oxford University Press, 2014.

Clowes, Robert W. "The Cognitive Integration of E-Memory." *Review of Philosophy and Psychology* 4, no. 1 (January 26, 2013): 107-33.

"Cochlear Implant Quick Facts." American Speech-Language-Hearing Association. http://www.asha.org/public/hearing/Cochlear-Implant-Quick-Facts/. Accessed December 8, 2016.

"Cochlear Implants." National Institute on Deafness and Other Communication Disorders (NIDCD), May 3, 2016. https://www.nidcd.nih.gov/health/cochlear-implants. Accessed December 8, 2016.

Coeckelbergh, Mark. "From Killer Machines to Doctrines and Swarms, or Why Ethics of Military Robotics Is Not (Necessarily) About Robots." *Philosophy & Technology* 24, no. 3 (2011): 269-78.

Cognitive Psychology. Second edition. Edited by Nick Braisby and Angus Gellatly. Oxford: Oxford University Press, 2012.

Coker, Christopher. "Biotechnology and War: The New Challenge." *Australian Army Journal* vol. II, no. 1 (2004): 125-40.

Collins, Allison, and Norm Schultz. "A review of ethics for competitive intelligence activities." *Competitive Intelligence Review* 7, no. 2 (1996): 56-66.

Coma Science: Clinical and Ethical Implications, edited by Steven Laureys, Nicholas D. Schiff, and Adrian M. Owen. New York: Elsevier, 2009.

Comai, Alessandro. "Global code of ethics and competitive intelligence purposes: an ethical perspective on competitors." *Journal of Competitive Intelligence and Management* 1, no. 3, 2003.

Comas and Disorders of Consciousness, edited by Caroline Schnakers and Steven Laureys. Springer-Verlag London, 2012.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Communication in the Age of Virtual Reality, edited by Frank Biocca and Mark R. Levy. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers, 1995.

Computer Synthesized Speech Technologies: Tools for Aiding Impairment, edited by John Mullennix and Steven Stern. Hershey, PA: Medical Information Science Reference, 2010.

Conant, Roger C., and W. Ross Ashby. "Every Good Regulator of a System Must Be a Model of That System." *International journal of systems science* 1, no. 2 (1970): 89-97.

Content of Premarket Submissions for Management of Cybersecurity in Medical Devices: Guidance for Industry and Food and Drug Administration Staff. Silver Spring, MD: US Food and Drug Administration, 2014.

Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science, edited by William Sims Bainbridge. Dordrecht: Springer Science+Business Media, 2003.

Cornwall, Warren. "In Pursuit of the Perfect Power Suit." *Science* 350, issue 6258 (2015): 270-73.

Cory, Jr., Gerald A. "Language, Brain, and Neuron." In *Toward Consilience*, pp. 193-205. Springer US, 2000.

Cosgrove, G.R. "Session 6: Neuroscience, brain, and behavior V: Deep brain stimulation." Meeting of the President's Council on Bioethics. Washington, DC, June 24-25, 2004. https://bioethicsarchive.georgetown.edu/pcbe/transcripts/june04/session6.html. Accessed June 12, 2015.

Coughlin, Thomas M. *Digital Storage in Consumer Electronics: The Essential Guide*. Burlington, MA: Newnes, 2008.

Crane, Andrew. "In the company of spies: When competitive intelligence gathering becomes industrial espionage." *Business Horizons* 48, no. 3 (2005): 233-40.

Cummings, James J., and Jeremy N. Bailenson. "How immersive is enough? A meta-analysis of the effect of immersive technology on user presence." *Media Psychology* 19, no. 2 (2016): 272-309.

Curtis, H. *Biology*. Fourth edition. New York: Worth, 1983.

"Cybersecurity for Medical Devices and Hospital Networks: FDA Safety Communication." US Food and Drug Administration, June 13, 2013. http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm356423.htm. Accessed May 3, 2016.

Cybersociety 2.0: Revisiting Computer-Mediated Communication and Community, edited by Steven G. Jones. Thousand Oaks: Sage Publications, 1998.

The Cyborg Experiments: The Extensions of the Body in the Media Age, edited by Joanna Zylinska. London: Continuum, 2002.

Cytowic, Richard E. *Synesthesia: A Union of the Senses.* Springer-Verlag New York, 1989.

Daft, Richard L. *Management*. Mason, OH: South-Western / Cengage Learning, 2011.

Daft, Richard L., Jonathan Murphy, and Hugh Willmott. *Organization Theory and Design.* Andover, Hampshire: Cengage Learning EMEA, 2010.

Daigle, K.R. "Manipulating the Mind: The Ethics of Cognitive Enhancement." Thesis, M.A. in Bioethics. Wake Forest University, 2010. https://wakespace.lib.wfu.edu/handle/10339/30407. Accessed May 8, 2016.

Dandamudi, Sivarama P. *Introduction to assembly language programming: from 8086 to Pentium processors*. Springer Science+Business Media New York, 1998.

Davies, Theresa Claire. *Audification of Ultrasound for Human Echolocation*. Dissertation, Ph.D. in Systems Design Engineering. Waterloo, Ontario: University of Waterloo, 2008.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Davis, Simon, Keith Nesbitt, and Eugene Nalivaiko. "A systematic review of cybersickness." In *Proceedings of the 2014 Conference on Interactive Entertainment*, pp. 1-9. ACM, 2014.

De Graaf, Maartje MA, and Somaya Ben Allouch. "Exploring influencing variables for the acceptance of social robots." *Robotics and Autonomous Systems* 61, no. 12 (2013): 1476-86.

De Melo-Martín, Inmaculada. "Genetically Modified Organisms (GMOs): Human Beings." In *Encyclopedia of Global Bioethics*, edited by Henk ten Have. Springer Science+Business Media Dordrecht. Version of March 13, 2015. doi: 10.1007/978-3-319-05544-2_210-1. Accessed January 21, 2016.

Deep Brain Stimulation for Parkinson's Disease, edited by Gordon H. Baltuch and Matthew B. Stern. Boca Raton: CRC Press, 2007.

Dellon, Brian, and Yoky Matsuoka. "Prosthetics, exoskeletons, and rehabilitation." *IEEE Robotics and Automation magazine* 14, no. 1 (2007): 30.

Denning, Tamara, Alan Borning, Batya Friedman, Brian T. Gill, Tadayoshi Kohno, and William H. Maisel. "Patients, pacemakers, and implantable defibrillators: Human values and security for wireless implantable medical devices." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 917-26. ACM, 2010.

Denning, Tamara, Yoky Matsuoka, and Tadayoshi Kohno. "Neurosecurity: Security and Privacy for Neural Devices." *Neurosurgical Focus* 27, no. 1 (2009): E7.

Digital Ecosystems: Society in the Digital Age, edited by Łukasz Jonak, Natalia Juchniewicz, and Renata Włoch. Warsaw: Digital Economy Lab, University of Warsaw, 2016.

DoD Architecture Framework Version 2.02. US Department of Defense, August 2010. http://dodcio.defense.gov/Portals/0/Documents/DODAF/DoDAF_v2-02_web.pdf. Accessed December 4, 2016.

Dormer, Kenneth J. "Implantable electronic otologic devices for hearing rehabilitation." In *Handbook of Neuroprosthetic Methods*, edited by Warren E. Finn and Peter G. LoPresti, pp. 237-60. Boca Raton: CRC Press, 2003.

Drummond, Katie. "Pentagon Preps Soldier Telepathy Push." *Wired*, May 14, 2009. https://www.wired.com/2009/05/pentagon-preps-soldier-telepathy-push/. Accessed December 5, 2016.

Dudai, Yadin. "The Neurobiology of Consolidations, Or, How Stable Is the Engram?" *Annual Review of Psychology* 55 (2004): 51-86.

Dumas II, Joseph D. *Computer Architecture: Fundamentals and Principles of Computer Design*. Boca Raton: CRC Press, 2006.

Edlinger, Günter, Cristiano Rizzo, and Christoph Guger. "Brain Computer Interface." In *Springer Handbook of Medical Technology*, edited by Rüdiger Kramme, Klaus-Peter Hoffmann, and Robert S. Pozos, 1003-17. Springer Berlin Heidelberg, 2011.

Electroreception, edited by Theodore H. Bullock, Carl D. Hopkins, Arthur N. Popper, and Richard R. Fay. New York: Springer Science+Business Media, 2005.

"Employee Tenure Summary." Washington, DC: US Department of Labor, Bureau of Labor Statistics, September 22, 2016. http://www.bls.gov/news.release/tenure.nro.htm. Accessed November 9, 2016.

Epinephrine in the Central Nervous System, edited by Jon M. Stolk, David C. U'Prichard, and Kjell Fuxe. Oxford University Press, 1988.

Ericsson, K. Anders, and Neil Charness. "Expert performance: Its structure and acquisition." *American Psychologist* 49, no. 8 (1994): 725-47.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Erikson, Jane. "Thought-Controlled Robotic Arm 'Makes a Big Negative a Whole Lot Better'." The University of Arizona Health Sciences, July 2013. http://medicine.arizona.edu/alumni/alumni-slide/thought-controlled-robotic-arm-%E2%80%98makes-big-negative-whole-lot-better%E2%80%99 Accessed December 5, 2016.

Evans, Dave. "The Internet of Everything: How More Relevant and Valuable Connections Will Change the World." Cisco Internet Solutions Business Group: Point of View, 2012. https://www.cisco.com/web/about/ac79/docs/innov/IoE.pdf. Accessed December 16, 2015.

Evans-Pughe, Christine. "Smarter Prosthetics: Researchers Are Working to Develop Artificial Limbs with Almost Life-like Levels of Functionality and Control." *Engineering and Technology* (June 2006): 32-36.

Evolutionary Linguistics, edited by April McMahon and Robert McMahon. New York: Cambridge University Press, 2013.

Fabbro, Franco, Salvatore M. Aglioti, Massimo Bergamasco, Andrea Clarici, and Jaak Panksepp. "Evolutionary aspects of self-and world consciousness in vertebrates." *Frontiers in human neuroscience* 9 (2015).

Fairchild, Alea M. *Technological Aspects of Virtual Organizations: Enabling the Intelligent Enterprise*. Springer Science+Business Media Dordrecht, 2004.

Fairclough, S.H. "Physiological Computing: Interfacing with the Human Nervous System." In *Sensing Emotions*, edited by J. Westerink, M. Krans, and M. Ouwerkerk, pp. 1-20. Philips Research Book Series 12. Springer Netherlands, 2010.

Falconer, Bruce. "Defense Research Agency Seeks to Create Supersoldiers." *Government Executive*, November 10, 2003. http://www.govexec.com/defense/2003/11/defense-research-agency-seeks-to-create-supersoldiers/15386/. Accessed May 22, 2016.

Farina, Dario, and Oskar Aszmann. "Bionic limbs: clinical reality and academic promises." *Science Translational Medicine* 6, no. 257 (2014): 257ps12.

Fayerman, Pamela. "Funding, doctors needed if brain stimulation surgery to expand in B.C." *Vancouver Sun*, 03.06.2013. http://www.vancouversun.com/health/Funding+doctors+needed+brain+stimulation+surgery+expand/8054047/story.html. Accessed December 8, 2016.

Federal Enterprise Architecture Framework, version 2. Washington, DC: Office of Management and Budget, January 29, 2013. https://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/fea_v2.pdf. Accessed November 18, 2016.

Fernandez-Lopez, Helena, José A. Afonso, J. H. Correia, and Ricardo Simoes. "The Need for Standardized Tests to Evaluate the Reliability of Data Transport in Wireless Medical Systems." In *Sensor Systems and Software*, edited by Francisco Martins, Luís Lopes, and Hervé Paulino, pp. 137-45. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 102. Springer Berlin Heidelberg, 2012.

Ferrando, Francesca. "Posthumanism, Transhumanism, Antihumanism, Metahumanism, and New Materialisms: Differences and Relations." *Existenz: An International Journal in Philosophy, Religion, Politics, and the Arts* 8, no. 2 (Fall 2013): 26-32.

Fiehler, Katja, Immo Schütz, Tina Meller, and Lore Thaler. "Neural correlates of human echolocation of path direction during walking." *Multisensory research* 28, no. 1-2 (2015): 195-226.

"FIPA Device Ontology Specification." Foundation for Intelligent Physical Agents (FIPA), May 10, 2002. http://www.fipa.org/assets/XC00091D.pdf. Accessed February 9, 2015.

Fleischmann, Kenneth R. "Sociotechnical Interaction and Cyborg–Cyborg Interaction: Transforming the Scale and Convergence of HCI." *The Information Society* 25, no. 4 (2009): 227-35.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Fountas, Kostas N., and J. R. Smith. "A Novel Closed-Loop Stimulation System in the Control of Focal, Medically Refractory Epilepsy." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, 357-62. Acta Neurochirurgica Supplements 97/2. Springer Vienna, 2007.

Frewer, Lynn J., Ivo A. van der Lans, Arnout RH Fischer, Machiel J. Reinders, Davide Menozzi, Xiaoyong Zhang, Isabelle van den Berg, and Karin L. Zimmermann. "Public perceptions of agri-food applications of genetic modification – A systematic review and meta-analysis." *Trends in Food Science & Technology* 30, no. 2 (2013): 142-52.

Frewer Lynn, Jesper Lassen, B. Kettlitz, Joachim Scholderer, Volkert Beekman, and Knut G. Berdal. "Societal aspects of genetically modified foods." *Food and Chemical Toxicology* 42, no. 7 (2004): 1181-93.

Friedenberg, Jay. *Artificial Psychology: The Quest for What It Means to Be Human*. Philadelphia: Psychology Press, 2008.

Friedman, Batya, and Helen Nissenbaum. "Bias in Computer Systems." In *Human Values and the Design of Computer Technology*, edited by Batya Friedman, pp. 21-40. CSL Lecture Notes 72. Cambridge: Cambridge University Press, 1997.

Fritz, Robert. *Corporate Tides: The Inescapable Laws of Organizational Structure*. San Francisco: Berret-Koehler, 1996.

Fukuyama, Francis. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. New York: Farrar, Straus, and Giroux, 2002.

The Future of Bioethics: International Dialogues, edited by Akira Akabayashi, Oxford: Oxford University Press, 2014.

Gallego, Juan Álvaro, Eduardo Rocon, Juan Manuel Belda-Lois, and José Luis Pons. "A neuroprosthesis for tremor management through the control of muscle co-contraction." *Journal of neuroengineering and rehabilitation* 10, no. 1 (2013): 1.

Gammelgård, Magnus, Mårten Simonsson, and Åsa Lindström. "An IT Management Assessment Framework: Evaluating Enterprise Architecture Scenarios." *Information Systems and E-Business Management* 5, no. 4 (2007): 415-35.

Garg, Anant Bhaskar. "Embodied Cognition, Human Computer Interaction, and Application Areas." In *Computer Applications for Web, Human Computer Interaction, Signal and Image Processing, and Pattern Recognition*, pp. 369-74. Springer Berlin Heidelberg, 2012.

Gasson, M.N. "Human ICT Implants: From Restorative Application to Human Enhancement." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 11-28. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Gasson, M.N. "ICT implants." In *The Future of Identity in the Information Society*, edited by S. Fischer-Hübner, P. Duquenoy, A. Zuccato, and L. Martucci, pp. 287-95. Springer US, 2008.

Gasson, M.N., Kosta, E., and Bowman, D.M. "Human ICT Implants: From Invasive to Pervasive." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 1-8. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Gen, Mitsuo, Runwei Cheng, and Lin Lin. *Network Models and Optimization: Multiobjective Genetic Algorithm Approach.* Springer-Verlag London Limited, 2008.

Gene Therapy of the Central Nervous System: From Bench to Bedside, edited by Michael G. Kaplitt and Matthew J. During. Amsterdam: Elsevier, 2006.

Gill, Satinder P. "Socio-Ethics of Interaction with Intelligent Interactive Technologies." *AI & SOCIETY* 22, no. 3 (October 26, 2007): 283-300.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Giustozzi, Emilie Steele, and Betsy Van der Veer Martens. "The new competitive intelligence agents: 'Programming' competitive intelligence ethics into corporate cultures." *Webology* 8, no. 2 (2011): 1.

Gladden, Matthew E. "The Artificial Life-Form as Entrepreneur: Synthetic Organism-Enterprises and the Reconceptualization of Business." In *Proceedings of the Fourteenth International Conference on the Synthesis and Simulation of Living Systems*, edited by Hiroki Sayama, John Rieffel, Sebastian Risi, René Doursat and Hod Lipson, pp. 417-18. The MIT Press, 2014.

Gladden, Matthew E. "Cryptocurrency with a Conscience: Using Artificial Intelligence to Develop Money that Advances Human Ethical Values." *Annales: Ethics in Economic Life* 18, no. 4 (2015): 85-98.

Gladden, Matthew E. "Cybershells, Shapeshifting, and Neuroprosthetics: Video Games as Tools for Posthuman 'Body Schema (Re)Engineering'." Keynote presentation at the Ogólnopolska Konferencja Naukowa Dyskursy Gier Wideo, Facta Ficta / AGH, Kraków, June 6, 2015.

Gladden, Matthew E. "The Diffuse Intelligent Other: An Ontology of Nonlocalizable Robots as Moral and Legal Actors." In *Social Robots: Boundaries, Potential, Challenges*, edited by Marco Nørskov, pp. 177-98. Farnham: Ashgate, 2016.

Gladden, Matthew E. "Enterprise Architecture for Neurocybernetically Augmented Organizational Systems: The Impact of Posthuman Neuroprosthetics on the Creation of Strategic, Structural, Functional, Technological, and Sociocultural Alignment." Thesis project, MBA in Innovation and Data Analysis. Warsaw: Institute of Computer Science, Polish Academy of Sciences, 2016.

Gladden, Matthew E. "From Stand Alone Complexes to Memetic Warfare: Cultural Cybernetics and the Engineering of Posthuman Popular Culture." Presentation at the 50 Shades of Popular Culture International Conference. Facta Ficta / Uniwersytet Jagielloński, Kraków, February 19, 2016.

Gladden, Matthew E. *The Handbook of Information Security for Advanced Neuroprosthetics*. Indianapolis: Synthypnion Academic, 2015.

Gladden, Matthew E. "Implantable Computers and Information Security: A Managerial Perspective." In *Posthuman Management: Creating Effective Organizations in an Age of Social Robotics, Ubiquitous AI, Human Augmentation, and Virtual Worlds*. Second edition, pp. 285-300. Indianapolis: Defragmenter Media, 2016.

Gladden, Matthew E. "Information Security Concerns as a Catalyst for the Development of Implantable Cognitive Neuroprostheses." In *9th Annual EuroMed Academy of Business (EMAB) Conference: Innovation, Entrepreneurship and Digital Ecosystems (EUROMED 2016) Book of Proceedings*, edited by Demetris Vrontis, Yaakov Weber, and Evangelos Tsoukatos, pp. 891-904. Engomi: EuroMed Press, 2016.

Gladden, Matthew E. "Leveraging the Cross-Cultural Capacities of Artificial Agents as Leaders of Human Virtual Teams." *Proceedings of the 10th European Conference on Management Leadership and Governance*, edited by Visnja Grozdanić, pp. 428-35. Reading: Academic Conferences and Publishing International Limited, 2014.

Gladden, Matthew E. "Managerial Robotics: A Model of Sociality and Autonomy for Robots Managing Human Beings and Machines." *International Journal of Contemporary Management* 13, no. 3 (2014): 67-76.

Gladden, Matthew E. "Managing the Ethical Dimensions of Brain-Computer Interfaces in eHealth: An SDLC-based Approach." In *9th Annual EuroMed Academy of Business (EMAB) Conference: Innovation, Entrepreneurship and Digital Ecosystems (EUROMED 2016) Book of*

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Proceedings, edited by Demetris Vrontis, Yaakov Weber, and Evangelos Tsoukatos, pp. 876-90. Engomi: EuroMed Press, 2016.

Gladden, Matthew E. "Neural Implants as Gateways to Digital-Physical Ecosystems and Posthuman Socioeconomic Interaction." In *Digital Ecosystems: Society in the Digital Age*, edited by Łukasz Jonak, Natalia Juchniewicz, and Renata Włoch, pp. 85-98. Warsaw: Digital Economy Lab, University of Warsaw, 2016.

Gladden, Matthew E. "Neuromarketing Applications of Neuroprosthetic Devices: An Assessment of Neural Implants' Capacities for Gathering Data and Influencing Behavior." In *9th Annual EuroMed Academy of Business (EMAB) Conference: Innovation, Entrepreneurship and Digital Ecosystems (EUROMED 2016) Book of Proceedings*, edited by Demetris Vrontis, Yaakov Weber, and Evangelos Tsoukatos, pp. 905-18. Engomi: EuroMed Press, 2016.

Gladden, Matthew E. "Organization Development and the Robotic-Cybernetic-Human Workforce: Humanistic Values for a Posthuman Future?" In *Posthuman Management: Creating Effective Organizations in an Age of Social Robotics, Ubiquitous AI, Human Augmentation, and Virtual Worlds*. Second edition, pp. 239-55. Indianapolis: Defragmenter Media, 2016.

Gladden, Matthew E. *Posthuman Management: Creating Effective Organizations in an Age of Social Robotics, Ubiquitous AI, Human Augmentation, and Virtual Worlds*. Second edition. Indianapolis: Defragmenter Media, 2016.

Gladden, Matthew E. *Sapient Circuits and Digitalized Flesh: The Organization as Locus of Technological Posthumanization*. Indianapolis: Defragmenter Media, 2016.

Gladden, Matthew E. "The Social Robot as 'Charismatic Leader': A Phenomenology of Human Submission to Nonhuman Power." In *Sociable Robots and the Future of Social Relations: Proceedings of Robo-Philosophy 2014*, edited by Johanna Seibt, Raul Hakli, and Marco Nørskov, pp. 329-39. Frontiers in Artificial Intelligence and Applications 273. IOS Press, 2014.

Gladden, Matthew E. "Utopias and Dystopias as Cybernetic Information Systems: Envisioning the Posthuman Neuropolity." *Creatio Fantastica* nr 3 (50) (2015).

Gockley, Rachel, Allison Bruce, Jodi Forlizzi, Marek Michalowski, Anne Mundell, Stephanie Rosenthal, Brennan Sellner, Reid Simmons, Kevin Snipes, Alan C. Schultz, and Jue Wang. "Designing Robots for Long-Term Social Interaction." In *2005 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2005)*, pp. 2199-2204. 2005.

Goldstein, E. Bruce. *Sensation and Perception.* Ninth edition. Belmont, CA: Wadsworth / CENGAGE Learning, 2014.

Goleman, Daniel. "What Makes a Leader?" *Harvard Business Review* 82 (1) (2004): 82-91.

Goodman, H. Maurice. *Basic Medical Endocrinology.* Fourth edition. Burlington, MA: Academic Press, 2009.

Graham, Stephen. "Imagining Urban Warfare: Urbanization and U.S. Military Technoscience." In *War, Citizenship, Territory*, edited by Deborah Cowen and Emily Gilbert. New York: Routledge, 2008.

Greve, Andrea, and Richard Henson. "What We Have Learned about Memory from Neuroimaging." In *The Wiley Handbook on the Cognitive Neuroscience of Memory*, edited by Donna Rose Addis, Morgan Barense, and Audrey Duarte, pp. 1-20. Malden, MA: John Wiley & Sons Ltd., 2015.

Grottke, M., H. Sun, R.M. Fricks, and K.S. Trivedi. "Ten fallacies of availability and reliability analysis." In *Service Availability*, pp. 187-206. Lecture Notes in Computer Science 5017. Springer Berlin Heidelberg, 2008.

Gunkel, David J. *The Machine Question: Critical Perspectives on AI, Robots, and Ethics*. Cambridge, MA: The MIT Press, 2012.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Gutnick, Tamar, Ruth A. Byrne, Binyamin Hochner, and Michael Kuba. "Octopus vulgaris uses visual information to determine the location of its arm." *Current Biology* 21, no. 6 (2011): 460-62.

Haki, Mohammad Kazem, Christine Legner, and Frederik Ahlemann. "Beyond EA Frameworks: Towards an Understanding of the Adoption of Enterprise Architecture Management." *ECIS 2012 Proceedings*, 2012.

Hameroff, Stuart, and Roger Penrose. "Consciousness in the universe: A review of the 'Orch OR' theory." *Physics of Life Reviews* 11, no. 1 (2014): 39-78.

Han, J.-H., S.A. Kushner, A.P. Yiu, H.-W. Hsiang, T. Buch, A. Waisman, B. Bontempi, R.L. Neve, P.W. Frankland, and S.A. Josselyn. "Selective Erasure of a Fear Memory." *Science* 323, no. 5920 (2009): 1492-96.

Hand, Eric. "Maverick scientist thinks he has discovered magnetic sixth sense in humans." *Science*, June 23, 2016. doi:10.1126/science.aaf5803. Accessed December 8, 2016.

Handbook of Cloud Computing, edited by Borko Furht and Armando Escalante. New York: Springer, 2010.

Handbook of Psychology, Volume 6: Developmental Psychology, edited by Richard M. Lerner, M. Ann Easterbrooks, and Jayanthi Mistry. Hoboken: John Wiley & Sons, Inc., 2003.

Hanson, R. "If uploads come first: The crack of a future dawn." *Extropy* 6, no. 2 (1994): 10-15.

Haraway, Donna. *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge, 1991.

Hargrove, Levi J., Ann M. Simon, Aaron J. Young, Robert D. Lipschutz, Suzanne B. Finucane, Douglas G. Smith, and Todd A. Kuiken. "Robotic leg control with EMG decoding in an amputee with nerve transfers." *New England Journal of Medicine* 369, no. 13 (2013): 1237-42.

Harman, Gilbert. *Thought.* Princeton: Princeton University Press, 1973.

Hatfield, B., A. Haufler, and J. Contreras-Vidal. "Brain Processes and Neurofeedback for Performance Enhancement of Precision Motor Behavior." In *Foundations of Augmented Cognition. Neuroergonomics and Operational Neuroscience*, edited by Dylan D. Schmorrow, Ivy V. Estabrooke, and Marc Grootjen, pp. 810-17. Lecture Notes in Computer Science 5638. Springer Berlin Heidelberg, 2009.

Haykin, Simon. *Neural Networks and Learning Machines.* Third edition. New York: Pearson Prentice Hall, 2009.

Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics.* Chicago: University of Chicago Press, 1999.

Heim, Michael. *The Metaphysics of Virtual Reality*. New York: Oxford University Press, 1993.

Henderson, John C., and H. Venkatraman. "Strategic alignment: Leveraging information technology for transforming organizations." *IBM systems journal* 32, no. 1 (1993): 472-84.

Herbrechter, Stefan. *Posthumanism: A Critical Analysis*. London: Bloomsbury, 2013. [Kindle edition.]

Herzberg, Frederick. "One more time: How do you motivate employees." In *The Leader-Manager*, edited by John N. Williamson, pp. 433-48. New York: John Wiley & Sons, Inc., 1986.

Heylighen, Francis. "The Global Brain as a New Utopia." In *Renaissance der Utopie. Zukunftsfiguren des 21. Jahrhunderts*, edited by R. Maresch and F. Rötzer. Frankfurt: Suhrkamp, 2002.

Hochmair, Ingeborg. "Cochlear Implants: Facts." MED-EL, September 2013. http://www.medel.com/cochlear-implants-facts. Accessed December 8, 2016.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Hoffmann, Klaus-Peter, and Silvestro Micera. "Introduction to Neuroprosthetics." In *Springer Handbook of Medical Technology*, edited by Rüdiger Kramme, Klaus-Peter Hoffmann, and Robert S. Pozos, pp. 785-800. Springer Berlin Heidelberg, 2011.

Højsgaard, Hjalte. "Market-Driven Enterprise Architecture." *Journal of Enterprise Architecture* 7, no. 1 (2011), 28.

Hoogervorst, Jan. "Enterprise Architecture: Enabling Integration, Agility and Change." *International Journal of Cooperative Information Systems* 13, no. 03 (2004): 213-33.

Horling, Bryan, and Victor Lesser. "A Survey of Multi-Agent Organizational Paradigms." *The Knowledge Engineering Review* 19, no. 04 (2004): 281-316.

Howard, Robert. "The CEO as Organizational Architect: An Interview with Xerox's Paul Allaire." *Harvard Business Review* 70 (5) (1992): 106-21.

Hutchinson, Douglas T. "The quest for the bionic arm." *Journal of the American Academy of Orthopaedic Surgeons* 22, no. 6 (2014): 346-51.

Iacob, Maria-Eugenia, Lucas O. Meertens, Henk Jonkers, Dick A.C. Quartel, Lambert J.M. Nieuwenhuis, and M.J. Van Sinderen. "From Enterprise Architecture to Business Models and Back." *Software & Systems Modeling* 13, no. 3 (2012): 1059-83.

Implantable Biomedical Microsystems: Design Principles and Applications, edited by Swarup Bhunia, Steve Majerus, and Mohamad Sawan. Oxford: William Andrew, 2015.

Implantable Neuroprostheses for Restoring Function, edited by Kevin Kilgore. Cambridge: Woodhead Publishing, 2015.

Implantable Sensor Systems for Medical Applications, edited by Andreas Inmann and Diana Hodgins. Woodhead Publishing, 2013.

Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments. Second edition. Edited by Somasundaram Gnanasundaram and Alok Shrivastava. Indianapolis: John Wiley & Sons, Inc., 2012.

ISO 15704:2000, Industrial automation systems – Requirements for enterprise-reference architectures and methodologies. ISO/TC 184/SC5. Geneva: ISO, 2000.

ISO 19439:2006, Enterprise integration – Framework for enterprise modelling. ISO/TC 184/SC5. Geneva: ISO, 2006.

ISO 27799:2016, Health informatics – Information security management in health using ISO/IEC 27002. ISO/TC 215. Geneva: ISO, 2016.

ISO/IEC 15288:2002, Systems engineering – System life cycle processes. ISO/IEC JTC 1/SC 7. Geneva: ISO, 2002.

ISO/IEC 7498-1:1994, Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model. ISO/IEC JTC 1. Geneva: ISO, 1994.

ISO/IEC/IEEE 42010:2010, Systems and software engineering – Architecture description. ISO/IEC JTC 1/SC 7. Geneva: ISO, 2011.

Johar, Swati. *Emotion, Affect and Personality in Speech: The Bias of Language and Paralanguage*. SpringerNature, 2016.

Josselyn, Sheena A. "Continuing the Search for the Engram: Examining the Mechanism of Fear Memories." *Journal of Psychiatry & Neuroscience : JPN* 35, no. 4 (2010): 221-28.

Jürgens, Uta, and Danko Nikolić. "Ideaesthesia: conceptual processes assign similar colours to similar shapes." *Translational Neuroscience* 3, no. 1 (2012): 22-27.

Kalat, James W. *Biological Psychology*. Ninth edition. Belmont, CA: Thomson Wadsworth, 2007.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Kanda, Takayuki, and Hiroshi Ishiguro. *Human-Robot Interaction in Social Robotics*. Boca Raton: CRC Press, 2013.

Kandjani, Hadi, Peter Bernus, and Lian Wen. "Enterprise Architecture Cybernetics for Complex Global Software Development: Reducing the Complexity of Global Software Development Using Extended Axiomatic Design Theory." In *2012 IEEE Seventh International Conference on Global Software Engineering*, pp. 169-73. IEEE, 2012.

Kaplan, Robert S., and David P. Norton. *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*. Boston: Harvard Business School Press, 2001.

Katz, Gregory. "The hypothesis of a genetic protolanguage: An epistemological investigation." *Biosemiotics* 1, no. 1 (2008): 57-73.

Kazienko, Przemysław, Radosław Michalski, and Sebastian Palus. "Social Network Analysis as a Tool for Improving Enterprise Architecture." In *Agent and Multi-Agent Systems: Technologies and Applications*, edited by James O'Shea, Ngoc Thanh Nguyen, Keeley Crockett, Robert J. Howlett, and Lakhmi C. Jain, pp. 651-60. Lecture Notes in Computer Science 6682. Springer Berlin Heidelberg, 2011.

Keenan, James F. "Enhancing Prosthetics for Soldiers Returning from Combat with Disabilities." *ET Studies* 4, no. 1 (2013): 69-88.

Kelly, Kevin. "A Taxonomy of Minds." *The Technium*, February 15, 2007. http://kk.org/thetechnium/a-taxonomy-of-m/. Accessed January 25, 2016.

Kelly, Kevin. "The Landscape of Possible Intelligences." *The Technium*, September 10, 2008. http://kk.org/thetechnium/the-landscape-0/. Accessed January 25, 2016.

Kelly, Kevin. *Out of Control: The New Biology of Machines, Social Systems and the Economic World*. Basic Books, 1994.

Kerr, Paul K., John Rollins, and Catherine A. Theohary. "The Stuxnet Computer Worm: Harbinger of an Emerging Warfare Capability." Congressional Research Service, 2010.

Kim, Kwang Jin, Xiaobo Tan, Hyouk Ryeol Choi, and David Pugal. *Biomimetic Robotic Artificial Muscles.* Singapore: World Scientific Publishing Co. Pte. Ltd., 2013.

Kinicki, Angelo, and Brian Williams. *Management: A Practical Introduction*. Fifth edition. New York: McGraw Hill, 2010.

KleinOsowski, A., Ethan H. Cannon, Phil Oldiges, and Larry Wissel. "Circuit design and modeling for soft errors." *IBM Journal of Research and Development* 52, no. 3 (2008): 255-63.

Koene, Randal A. "Embracing Competitive Balance: The Case for Substrate-Independent Minds and Whole Brain Emulation." In *Singularity Hypotheses*, edited by Amnon H. Eden, James H. Moor, Johnny H. Søraker, and Eric Steinhart, pp. 241-67. The Frontiers Collection. Springer Berlin Heidelberg, 2012.

Kohno, T., T. Denning, and Y. Matsuoka. "Security and Privacy for Neural Devices." *Neurosurgical Focus* 27 (2009): 1-4.

Koltko-Rivera, Mark E. "The potential societal impact of virtual reality." *Advances in virtual environments technology: Musings on design, evaluation, and applications* 9 (2005).

Koops, B.-J., and R. Leenes. "Cheating with Implants: Implications of the Hidden Information Advantage of Bionic Ears and Eyes." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 113-34. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Kosta, E., and D.M. Bowman, "Implanting Implications: Data Protection Challenges Arising from the Use of Human ICT Implants." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 97-112. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Kostov, Aleksander, and Mark Polak. "Parallel man-machine training in development of EEG-based cursor control." *IEEE Transactions on Rehabilitation Engineering* 8, no. 2 (2000): 203-05.

Kourany, J.A. "Human Enhancement: Making the Debate More Productive." *Erkenntnis* 79, no. 5 (2013): 981-98.

Kowalewska, Agata. "Symbionts and Parasites – Digital Ecosystems." In *Digital Ecosystems: Society in the Digital Age*, edited by Łukasz Jonak, Natalia Juchniewicz, and Renata Włoch, pp. 73-84. Warsaw: Digital Economy Lab, University of Warsaw, 2016.

Kraemer, Felicitas. "Me, Myself and My Brain Implant: Deep Brain Stimulation Raises Questions of Personal Authenticity and Alienation." *Neuroethics* 6, no. 3 (May 12, 2011): 483-97. doi:10.1007/s12152-011-9115-7.

Krishnan, Armin. "Enhanced Warfighters as Private Military Contractors." In *Super Soldiers: The Ethical, Legal and Social Implications*, edited by Jai Galliott and Mianna Lotz. London: Routledge, 2015.

Krishnan, Armin. "From Psyops to Neurowar: What Are the Dangers?" ISAC-ISSS 2014 Annual Conference on Security Studies. University of Texas, Austin, Texas, November 16, 2014. http://web.isanet.org/Web/Conferences/ISSS%20Austin%202014/Archive/b137347c-6281-466d-b9e7-ef7e0e5d363c.pdf. Accessed May 8, 2016.

Kruchten, Philippe B. "The 4+1 view model of architecture." *IEEE software* 12, no. 6 (1995): 42-50.

Kshirsagar, Sumedha, Chris Joslin, Won-Sook Lee, and Nadia Magnenat-Thalmann. "Personalized Face and Speech Communication over the Internet." In *Proceedings of IEEE Virtual Reality 2001*, edited by Haruo Takemura and Kiyoshi Kiyokawa, pp. 37-44. Los Alamitos, CA: IEEE, 2001.

Kusek, Kristen. "The $3 Million Suit: Wyss Institute Wins DARPA Grant to Further Develop its Soft Exosuit." *Harvard Gazette*, September 11, 2014. http://news.harvard.edu/gazette/story/2014/09/the-3-million-suit/. Accessed December 5, 2016.

Kyllonen, Patrick C., and Raymond E. Christal. "Reasoning ability is (little more than) working-memory capacity?!" *Intelligence* 14, no. 4 (1990): 389-433.

LaFleur, Karl, Kaitlin Cassady, Alexander Doud, Kaleb Shades, Eitan Rogin, and Bin He. "Quadcopter control in three-dimensional space using a noninvasive motor imagery-based brain-computer interface." *Journal of neural engineering* 10, no. 4 (2013): 046003.

Lamm, Ehud, and Ron Unger. *Biological Computation.* Boca Raton: CRC Press, 2011.

Land, Martin Op 't, Erik Proper, Maarten Waage, Jeroen Cloo, and Claudia Steghuis. "Positioning Enterprise Architecture." In *Enterprise Architecture*, pp. 25-47. The Enterprise Engineering Series. Springer Berlin Heidelberg, 2009.

Lebedev, M. "Brain-Machine Interfaces: An Overview." *Translational Neuroscience* 5, no. 1 (March 28, 2014): 99-110.

Leder, Felix, Tillmann Werner, and Peter Martini. "Proactive Botnet Countermeasures: An Offensive Approach." In *The Virtual Battlefield: Perspectives on Cyber Warfare,* volume 3, edited by Christian Czosseck and Kenneth Geers, pp. 211-25. IOS Press, 2009.

Leed, Maren. *Offensive Cyber Capabilities at the Operational Level: The Way Ahead*. Washington, DC: Center for Strategic and International Studies, 2013.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Li, S., F. Hu, and G. Li, "Advances and Challenges in Body Area Network." In *Applied Informatics and Communication*, edited by J. Zhan, pp. 58-65. Communications in Computer and Information Science 22. Springer Berlin Heidelberg, 2011.

Lilley, Stephen. *Transhumanism and Society: The Social Debate over Human Enhancement*. Springer Science & Business Media, 2013.

Lin, James C. "Hearing microwaves: The microwave auditory phenomenon." *IEEE Antennas and Propagation Magazine* 43, no. 6 (2001): 166-68.

Lind, Jürgen. "Issues in agent-oriented software engineering." In *Agent-Oriented Software Engineering*, pp. 45-58. Springer Berlin Heidelberg, 2001.

Lindström, Åsa, Pontus Johnson, Erik Johansson, Mathias Ekstedt, and Mårten Simonsson. "A Survey on CIO Concerns – Do Enterprise Architecture Frameworks Support Them?" *Information Systems Frontiers* 8, no. 2 (2006).

Ling, Geoffrey SF, Peter Rhee, and James M. Ecklund. "Surgical innovations arising from the Iraq and Afghanistan wars." *Annual review of medicine* 61 (2010): 457-68.

Linsenmeier, Robert A. "Retinal Bioengineering." In *Neural Engineering*, edited by Bin He, pp. 421-84. Bioelectric Engineering. Springer US, 2005.

Liu, Hanjun, and Manwa L. Ng. "Electrolarynx in voice rehabilitation," *Auris Nasus Larynx* 34, no. 3 (2007): 327-32.

Liu, Kecheng, Lily Sun, Dian Jambari, Vaughan Michell, and Sam Chong. "A Design of Business-Technology Alignment Consulting Framework." In *Advanced Information Systems Engineering*, edited by Haralambos Mouratidis and Colette Rolland, pp. 422-35. Lecture Notes in Computer Science 6741. Springer Berlin Heidelberg, 2011.

Lloyd, David. "Biological Time Is Fractal: Early Events Reverberate over a Life Time." *Journal of Biosciences* 33, no. 1 (March 1, 2008): 9-19.

LoBello, Lucia, and Emanuele Toscano. "An adaptive approach to topology management in large and dense real-time wireless sensor networks." *IEEE Transactions on Industrial Informatics* 5, no. 3 (2009): 314-24.

Logan, Lynne Romeiser. "Rehabilitation techniques to maximize spasticity management." *Topics in stroke rehabilitation* 18, no. 3 (2011): 203-11.

Lohn, Andrew J., Patrick R. Mickel, James B. Aimone, Erik P. Debenedictis, and Matthew J. Marinella. "Memristors as Synapses in Artificial Neural Networks: Biomimicry Beyond Weight Change." In *Cybersecurity Systems for Human Cognition Augmentation*, edited by Robinson E. Pino, Alexander Kott, and Michael Shevenell, pp. 135-50. Springer International Publishing, 2014.

Longuet-Higgins, H.C. "Holographic Model of Temporal Recall." *Nature* 217, no. 5123 (1968): 104.

Lorence, Daniel, Anusha Sivaramakrishnan, and Michael Richards. "Transaction-Neutral Implanted Data Collection Interface as EMR Driver: A Model for Emerging Distributed Medical Technologies." *Journal of Medical Systems* 34, no. 4 (March 20, 2009): 609-17.

Luber, B., C. Fisher, P.S. Appelbaum, M. Ploesser, and S.H. Lisanby. "Non-invasive brain stimulation in the detection of deception: Scientific challenges and ethical consequences." *Behavioral Sciences and the Law* 27, no. 2 (2009): 191-208.

Lune, Howard. *Understanding Organizations*, Cambridge: Polity Press, 2010.

Lyon, David. "Beyond Cyberspace: Digital Dreams and Social Bodies." In *Education and Society*, third edition, edited by Joseph Zajda, pp. 221-38. Albert Park: James Nicholas Publishers, 2001.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Ma, Jianhua, Kim-Kwang Raymond Choo, Hui-huang Hsu, Qun Jin, William Liu, Kevin Wang, Yufeng Wang, and Xiaokang Zhou. "Perspectives on Cyber Science and Technology for Cyberization and Cyber-Enabled Worlds." In *2016 IEEE 14th International Conference on Dependable, Autonomic and Secure Computing, 14th International Conference on Pervasive Intelligence and Computing, 2nd International Conference on Big Data Intelligence and Computing and Cyber Science and Technology Congress (DASC/PiCom/DataCom/CyberSciTech)*, pp. 1-9. IEEE, 2016.

Ma, Wei Ji, Masud Husain, and Paul M. Bays. "Changing concepts of working memory." *Nature neuroscience* 17, no. 3 (2014): 347-56.

MacLennan, Elzavita, and Jean-Paul Van Belle. "Factors Affecting the Organizational Adoption of Service-Oriented Architecture (SOA)." *Information Systems and E-Business Management* 12, no. 1 (January 5, 2013): 71-100.

MacVittie, Kevin, Jan Halámek, Lenka Halámková, Mark Southcott, William D. Jemison, Robert Lobel, and Evgeny Katz. "From 'cyborg' lobsters to a pacemaker powered by implantable biofuel cells." *Energy & Environmental Science* 6, no. 1 (2013): 81-86.

Magnetic Stimulation in Clinical Neurophysiology. Second edition. Edited by Mark Hallett and Sudhansu Chokroverty. Philadelphia: Elsevier Butterworth Heinemann, 2005.

Magoulas, Thanos, Aida Hadzic, Ted Saarikko, and Kalevi Pessi. "Alignment in Enterprise Architecture: A Comparative Analysis of Four Architectural Approaches." *Electronic Journal Information Systems Evaluation* 15, no. 1 (2012).

Maguire, Gerald Q., and Ellen M. McGee. "Implantable brain chips? Time for debate." *Hastings Center Report* 29, no. 1 (1999): 7-13.

Maitra, Amit K. "Offensive cyber-weapons: technical, legal, and strategic aspects." *Environment Systems and Decisions* 35, no. 1 (2015): 169-82.

Mak, Stephen. "Ethical Values for E-Society: Information, Security and Privacy." In *Ethics and Policy of Biometrics*, edited by Ajay Kumar and David Zhang, 96-101. Lecture Notes in Computer Science 6005. Springer Berlin Heidelberg, 2010.

Mangun, George R. *The Neuroscience of Attention: Attentional Control and Selection*. Oxford University Press, 2012.

Martin, Richard, and Edward Robertson. "A Comparison of Frameworks for Enterprise Architecture Modeling." In *Conceptual Modeling - ER 2003*, edited by Il-Yeol Song, Stephen W. Liddle, Tok-Wang Ling, and Peter Scheuermann. Lecture Notes in Computer Science 2813. Springer Berlin Heidelberg, 2003.

Mascarenhas, S., R. Prada, A. Paiva, and G.J. Hofstede. "Social Importance Dynamics: A Model for Culturally-Adaptive Agents." In *Intelligent Virtual Agents*, pp. 325-38. Lecture Notes in Computer Science no. 8108. Springer Berlin Heidelberg, 2013.

McCullagh, P., G. Lightbody, J. Zygierewicz, and W.G. Kernohan, "Ethical Challenges Associated with the Development and Deployment of Brain Computer Interface Technology." *Neuroethics* 7, no. 2 (July 28, 2013): 109-22.

McCulloh, Ian A., Helen L. Armstrong, and Anthony N. Johnson. *Social Network Analysis with Applications.* Hoboken, NJ: John Wiley & Sons, Inc., 2013.

McGaugh, James L., and Benno Roozendaal. "Role of adrenal stress hormones in forming lasting memories in the brain." *Current opinion in neurobiology* 12, no. 2 (2002): 205-10.

McGee, E.M. "Bioelectronics and Implanted Devices." In *Medical Enhancement and Posthumanity*, edited by Bert Gordijn and Ruth Chadwick, pp. 207-24. The International Library of Ethics, Law and Technology 2. Springer Netherlands, 2008.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

McGrath, Michael J., and Cliodhna Ní Scanaill. "Regulations and Standards: Considerations for Sensor Technologies." In *Sensor Technologies*, pp. 115-35. Apress, 2013.

McIntosh, Daniel. "The Transhuman Security Dilemma." *Journal of Evolution and Technology* 21, no. 2 (2010): 32-48.

Mehlman, Maxwell J. *Transhumanist Dreams and Dystopian Nightmares: The Promise and Peril of Genetic Engineering*. Baltimore: The Johns Hopkins University Press, 2012.

Mercanzini, André, and Philippe Renaud. *Microfabricated Cortical Neuroprostheses*. Boca Raton: CRC Press, 2010.

Merkel, R., G. Boer, J. Fegert, T. Galert, D. Hartmann, B. Nuttin, and S. Rosahl. "Central Neural Prostheses." In *Intervening in the Brain: Changing Psyche and Society*, pp. 117-60. Ethics of Science and Technology Assessment 29. Springer Berlin Heidelberg, 2007.

Mezzanotte, Sr., Dominic M., and Josh Dehlinger. "Enterprise Architecture: A Framework Based on Human Behavior Using the Theory of Structuration." In *Software Engineering Research, Management and Applications 2012*, edited by Roger Lee, pp. 65-79. Studies in Computational Intelligence 430. Springer Berlin Heidelberg, 2012.

Miah, Andy. "A Critical History of Posthumanism." In *Medical Enhancement and Posthumanity*, edited by Bert Gordijn and Ruth Chadwick, pp. 71-94. The International Library of Ethics, Law and Technology 2. Springer Netherlands, 2008.

Miller, Kai J., and Jeffrey G. Ojemann. "A Simple, Spectral-Change Based, Electrocorticographic Brain–Computer Interface." In *Brain-Computer Interfaces*, edited by Bernhard Graimann, Gert Pfurtscheller, and Brendan Allison, pp. 241-58. The Frontiers Collection. Springer Berlin Heidelberg, 2009.

Miller, Jr., Gerald Alva. "Conclusion: Beyond the Human: Ontogenesis, Technology, and the Posthuman in Kubrick and Clarke's 2001." In *Exploring the Limits of the Human through Science Fiction*, pp. 163-90. American Literature Readings in the 21st Century. Palgrave Macmillan US, 2012.

Min Neo, Hui, and Romain Fonsegrives. "For these 'cyborgs,' keys are so yesterday." AFP / Yahoo! Tech, September 4, 2015. https://www.yahoo.com/tech/cyborgs-keys-yesterday-114442441.html. Accessed December 8, 2016.

"Mind over Mouth? Study Could Lead to Communicating via Thoughts." UCI News, August 13, 2008. https://news.uci.edu/briefs/mind-over-mouth-study-could-lead-to-communicating-via-thoughts/. Accessed December 5, 2016.

Mitcheson, Paul D. "Energy harvesting for human wearable and implantable bio-sensors." In *Engineering in Medicine and Biology Society (EMBC), 2010 Annual International Conference of the IEEE,* pp. 3432-36. IEEE, 2010.

Mizraji, Eduardo, Andrés Pomi, and Juan C. Valle-Lisboa. "Dynamic Searching in the Brain." *Cognitive Neurodynamics* 3, no. 4 (June 3, 2009): 401-14.

Møller, Aage R. *Sensory Systems: Anatomy and Physiology*. Third edition. Aage R Møller, 2014.

Moravec, Hans. *Mind Children: The Future of Robot and Human Intelligence*. Cambridge: Harvard University Press, 1990.

Moreno, Jonathan. "DARPA On Your Mind." *Cerebrum* vol. 6 issue 4 (2004): 92-100.

Moxon, David. *Memory.* Oxford: Heinemann Educational Publishers, 2000.

Mubin, Omar, Christoph Bartneck, Loe Feijs, Hanneke Hooft van Huysduynen, Jun Hu, and Jerry Muelver. "Improving speech recognition with the robot interaction language." *Disruptive Science and Technology* 1, no. 2 (2012): 79-88.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Mubin, Omar, Joshua Henderson, and Christoph Bartneck. "Talk ROILA to your Robot." In *Proceedings of the 15th Conference on International conference on multimodal interaction*, pp. 317-18. ACM, 2013.

Mueller, Scott. *Upgrading and Repairing PCs, 20th Edition*. Indianapolis: Que, 2012.

Mulhauser, Gregory R. "On the end of a quantum mechanical romance." *Psyche* 2, no. 5 (1995).

Murphy, Robin. *Introduction to AI Robotics*. Cambridge, MA: The MIT Press, 2000.

Muscolino, Joseph E. *Kinesiology: The Skeletal System and Muscle Function.* Third edition. St. Louis: Elsevier, 2017.

Nadler, David, and Michael Tushman. *Competing by Design: The Power of Organizational Architecture*. Oxford University Press, 1997. [Kindle edition.]

Nakakawa, Agnes, Patrick van Bommel, and H. A. Erik Proper. "Quality Enhancement in Creating Enterprise Architecture: Relevance of Academic Models in Practice." In *Advances in Enterprise Engineering II*, edited by Erik Proper, Frank Harmsen, and Jan L. G. Dietz, pp. 109-33. Lecture Notes in Business Information Processing 28. Springer Berlin Heidelberg, 2009.

The Nature of Time: Geometry, Physics and Perception, edited by Rosolino Buccheri, Metod Saniga, and William Mark Stuckey. Springer Science+Business Media Dordrecht, 2003.

Nayar, Pramod K. *An Introduction to New Media and Cybercultures.* Chichester: John Wiley & Sons Ltd., 2010.

Negoescu, R. "Conscience and Consciousness in Biomedical Engineering Science and Practice." In *International Conference on Advancements of Medicine and Health Care through Technology*, edited by Simona Vlad, Radu V. Ciupa, and Anca I. Nicu, pp. 209-14. IFMBE Proceedings 26. Springer Berlin Heidelberg, 2009.

Neubauer, André, Jürgen Freudenberger, and Volker Kühn. *Coding Theory: Algorithms, Architectures and Applications*. Chichester: John Wiley & Sons Ltd., 2007.

Neuper, Christa, and Gert Pfurtscheller. "Neurofeedback Training for BCI Control." In *Brain-Computer Interfaces*, edited by Bernhard Graimann, Gert Pfurtscheller, and Brendan Allison, pp. 65-78. The Frontiers Collection. Springer Berlin Heidelberg, 2009.

Neuroimaging and Memory, edited by Jonathan K. Foster. Hove, East Sussex: Psychology Press Ltd., 1999.

The Neuroscience of Sleep, edited by Robert Stickgold and Matthew P. Walker. London: Elsevier, 2009.

Neuweiler, Gerhard. "Evolutionary aspects of bat echolocation." *Journal of Comparative Physiology A* 189, no. 4 (2003): 245-256.

Niku, Saeed B. *Introduction to Robotics: Analysis, Control, Applications.* Second edition. Hoboken: John Wiley & Sons, Inc., 2011.

NIST Special Publication 1800-1b: Securing Electronic Health Records on Mobile Devices: Approach, Architecture, and Security Characteristics. Leah Kauffman, editor-in-chief. Gaithersburg, MD: National Institute of Standards & Technology, 2015.

NIST Special Publication 800-100: Information Security Handbook: A Guide for Managers. Edited by P. Bowen, J. Hash, and M. Wilson. Gaithersburg, MD: National Institute of Standards & Technology, 2006.

NIST Special Publication 800-53, Revision 4: Security and Privacy Controls for Federal Information Systems and Organizations. Joint Task Force Transformation Initiative. Gaithersburg, MD: National Institute of Standards & Technology, 2013.

Niven, Jeremy E. "Invertebrate neurobiology: Visual direction of arm movements in an octopus." *Current Biology* 21, no. 6 (2011): R217-R218.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Noran, Ovidiu. "A Mapping of Individual Architecture Frameworks (GRAI, PERA, C4ISR, CIMOSA, ZACHMAN, ARIS) onto GERAM." In *Handbook on Enterprise Architecture*, edited by Peter Bernus, Laszlo Nemes, and Günter Schmidt, pp. 65-210. International Handbooks on Information Systems. Springer Berlin Heidelberg, 2003.

Nouvel, Pascal. "A Scale and a Paradigmatic Framework for Human Enhancement." In *Inquiring into Human Enhancement*, edited by Simone Bateman, Jean Gayon, Sylvie Allouche, Jérôme Goffette, and Michela Marzano, pp. 103-18. Palgrave Macmillan UK, 2015.

Novaković, Branko, Dubravko Majetić, Josip Kasać, and Danko Brezak. "Artificial Intelligence and Biorobotics: Is an Artificial Human Being our Destiny?" In *Annals of DAAAM for 2009 & Proceedings of the 20th International DAAAM Symposium "Intelligent Manufacturing & Automation: Focus on Theory, Practice and Education,"* edited by Branko Katalinic, pp. 121-22. Vienna: DAAAM International, 2009.

Null, Linda, and Julia Lobur. *The Essentials of Computer Organization and Architecture*. Second edition. Sudbury, MA: Jones and Bartlett Publishers, 2006.

Obaid, M., I. Damian, F. Kistler, B. Endrass, J. Wagner, and E. André. "Cultural Behaviors of Virtual Agents in an Augmented Reality Environment." In *Intelligent Virtual Agents*, pp. 412-18. Lecture Notes in Computer Science no. 7502. Springer Berlin Heidelberg, 2012.

Ochsner, Beate, Markus Spöhrer, and Robert Stock. "Human, non-human, and beyond: cochlear implants in socio-technological environments." *NanoEthics* 9, no. 3 (2015): 237-50.

Okun, Michael S. "Parkinson's Disease: Guide to Deep Brain Stimulation Therapy." Second edition. National Parkinson Foundation, 2014. http://www.parkinson.org/sites/default/files/Guide_to_DBS_Stimulation_Therapy.pdf. Accessed December 8, 2016.

Olson, Eric T. "Personal Identity." *The Stanford Encyclopedia of Philosophy* (Fall 2015 Edition), edited by Edward N. Zalta. http://plato.stanford.edu/archives/fall2015/entries/identity-personal/. Accessed January 17, 2016.

Osterwalder, Alexander, and Yves Pigneur. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons, 2010.

The Oxford Handbook of Philosophy of Perception, edited by Mohan Matthen. Oxford: Oxford University Press, 2015.

Panno, Joseph. *Gene Therapy: Treating Disease by Repairing Genes*. New York: Facts on File, 2005.

Panoulas, Konstantinos J., Leontios J. Hadjileontiadis, and Stavros M. Panas. "Brain-Computer Interface (BCI): Types, Processing Perspectives and Applications." In *Multimedia Services in Intelligent Environments*, edited by George A. Tsihrintzis and Lakhmi C. Jain, pp. 299-321. Smart Innovation, Systems and Technologies 3. Springer Berlin Heidelberg, 2010.

Park, M.C., M.A. Goldman, T.W. Belknap, and G.M. Friehs. "The Future of Neural Interface Technology." In *Textbook of Stereotactic and Functional Neurosurgery*, edited by A.M. Lozano, P.L. Gildenberg, and R.R. Tasker, pp. 3185-3200. Heidelberg/Berlin: Springer, 2009.

Parker, Donn B. "Toward a New Framework for Information Security." In *The Computer Security Handbook*, fourth edition, edited by Seymour Bosworth and M. E. Kabay. John Wiley & Sons, 2002.

Patel, Rajeev, Robert J. Torres, and Peter Rosset. "Genetic engineering in agriculture and corporate engineering in public debate: risk, public relations, and public debate over genetically modified crops." *International journal of occupational and environmental health* 11, no. 4 (2005).

Patil, P.G., and D.A. Turner. "The Development of Brain-Machine Interface Neuroprosthetic Devices." In *Neurotherapeutics* 5, no. 1 (January 1, 2008): 137-46.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Patoine, Brenda. "Progress Report 2010: Deep Brain Stimulation – The 2010 Progress Report on Brain Research." The Dana Foundation, January 2010. http://www.dana.org/Publications/ReportDetails.aspx?id=44348. Accessed December 8, 2016.

Payr, S., and Trappl, R. "Agents across Cultures." In *Intelligent Virtual Agents*, pp. 320-24. Lecture Notes in Computer Science 2792. Springer Berlin Heidelberg, 2003.

Pazzaglia, Mariella, and Marco Molinari. "The embodiment of assistive devices – from wheelchair to exoskeleton." *Physics of Life Reviews* 16 (2016): 163-75.

Pearce, David. "The Biointelligence Explosion." In *Singularity Hypotheses*, edited by A.H. Eden, J.H. Moor, J.H. Søraker, and E. Steinhart, pp. 199-238. The Frontiers Collection. Berlin/Heidelberg: Springer, 2012.

Peigneux, Philippe. "Neuroimaging Studies of Sleep and Memory in Humans." In *Sleep, Neuronal Plasticity and Brain Function*, edited by Peter Meerlo, Ruth M. Benca, and Ted Abel, pp. 239-68. Springer Berlin Heidelberg, 2015.

Pérez Ríos, José. "Systems Thinking, Organisational Cybernetics and the Viable System Model." In *Design and Diagnosis for Sustainable Organizations*, pp. 1-64. Springer Berlin Heidelberg, 2012.

Peterson, David J. *The Art of Language Invention: From Horse-Lords to Dark Elves, The Words Behind World-Building*. New York: Penguin Books, 2015.

Pino, Robinson E., and Alexander Kott. "Neuromorphic Computing for Cognitive Augmentation in Cyber Defense." In *Cybersecurity Systems for Human Cognition Augmentation,* edited by Robinson E. Pino, Alexander Kott, and Michael Shevenell, pp. 19-46. Springer International Publishing, 2014.

Polcar, Jiri, and Petr Horejsi. "Knowledge Acquisition and Cyber Sickness: A Comparison of VR Devices in Virtual Tours." *MM Science Journal* (June 2015): 613-16.

Pollatsek, Alexander. "The Role of Sound in Silent Reading." In *The Oxford Handbook of Reading*, edited by Alexander Pollatsek and Rebecca Treiman, pp. 185-201. New York: Oxford University Press, 2015.

Postmarket Management of Cybersecurity in Medical Devices: Draft Guidance for Industry and Food and Drug Administration Staff. Silver Spring, MD: US Food and Drug Administration, 2016.

Prestes, E., J.L. Carbonera, S. Rama Fiorini, V.A.M. Jorge, M. Abel, R. Madhavan, A. Locoro, et al. "Towards a Core Ontology for Robotics and Automation." *Robotics and Autonomous Systems* 61, no. 11 (November 2013): 1193-1204.

Pribram, K.H. "Prolegomenon for a Holonomic Brain Theory." In *Synergetics of Cognition*, edited by Hermann Haken and Michael Stadler, pp. 150-84. Springer Series in Synergetics 45. Springer Berlin Heidelberg, 1990.

Pribram, K.H., and S.D. Meade. "Conscious Awareness: Processing in the Synaptodendritic Web – The Correlation of Neuron Density with Brain Size." *New Ideas in Psychology* 17, no. 3 (December 1, 1999): 205-14.

Primer on the Autonomic Nervous System. Third edition. Edited by David Robertson, Italo Biaggioni, Geoffrey Burnstock, Phillip A. Low, and Julian F.R. Paton. London: Academic Press, 2012.

Principe, José C., and Dennis J. McFarland. "BMI/BCI Modeling and Signal Processing." In *Brain-Computer Interfaces*, pp. 47-64. Springer Netherlands, 2008.

"Products and Procedures." Medtronic, 2016. http://professional.medtronic.com/pt/neuro/dbs-md/prod/index.htm. Accessed December 8, 2016.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

"Prosthetics: Sponsor." Johns Hopkins Applied Physics Laboratory. http://www.jhuapl.edu/prosthetics/program/sponsor.asp. Accessed December 5, 2016.

Proudfoot, Diane. "Software Immortals: Science or Faith?" In *Singularity Hypotheses*, edited by Amnon H. Eden, James H. Moor, Johnny H. Søraker, and Eric Steinhart, pp. 367-92. The Frontiers Collection. Springer Berlin Heidelberg, 2012.

Putnam, Hilary. *Reason, Truth and History*. Cambridge: Cambridge University Press, 1981.

Radvansky, Gabriel A. *Human Memory.* Second edition. New York: Routledge, 2016.

Ramirez, S., X. Liu, P.-A. Lin, J. Suh, M. Pignatelli, R.L. Redondo, T.J. Ryan, and S. Tonegawa. "Creating a False Memory in the Hippocampus." *Science* 341, no. 6144 (2013): 387-91.

Rao, R.P.N., A. Stocco, M. Bryan, D. Sarma, T.M. Youngquist, J. Wu, and C.S. Prat. "A direct brain-to-brain interface in humans." *PLoS ONE* 9, no. 11 (2014).

Rao, Umesh Hodeghatta, and Umesha Nayak. *The InfoSec Handbook*. New York: Apress, 2014.

Regalado, Antonio. "Engineering the perfect baby." *MIT Technology Review* 118, no. 3 (2015): 27-33.

Rehm, M., André, E., and Nakano, Y. "Some Pitfalls for Developing Enculturated Conversational Agents." In *Human-Computer Interaction: Ambient, Ubiquitous and Intelligent Interaction*, pp. 340-48. Lecture Notes in Computer Science 5612. Springer Berlin Heidelberg, 2009.

Rehm, M., Y. Nakano, E. André, T. Nishida, N. Bee, B. Endrass, M. Wissner, A.A. Lipi, and H. Huang, "From observation to simulation: generating culture-specific behavior for interactive systems." *AI & SOCIETY* vol. 24, no. 3 (2009): 267-80.

Reynolds, Dwight W., Christina M. Murray, and Robin E. Germany. "Device Therapy for Remote Patient Management." In *Electrical Diseases of the Heart*, edited by Ihor Gussak, Charles Antzelevitch, Arthur A. M. Wilde, Paul A. Friedman, Michael J. Ackerman, and Win-Kuang Shen, pp. 809-25. Springer London, 2008.

Robertazzi, Thomas G. *Networks and Grids: Technology and Theory*. Springer-Verlag New York, 2007.

Robinett, W. "The consequences of fully understanding the brain." In *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science*, edited by M.C. Roco and W.S. Bainbridge, pp. 166-70. National Science Foundation, 2002.

Roden, David. *Posthuman Life: Philosophy at the Edge of the Human*. Abingdon: Routledge, 2014.

Rodriguez, Ana Maria. *Autism Spectrum Disorders*. Minneapolis: Twenty-First Century Books, 2011.

Rohloff, Michael. "Framework and Reference for Architecture Design." In *AMCIS 2008 Proceedings*, 2008. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.231.8261&rep=rep1&type=pdf. Accessed October 21, 2015.

Rookes, Paul, and Jane Willson. *Perception: Theory, Development and Organisation.* London: Routledge, 2000.

Roosendaal, Arnold. "Implants and Human Rights, in Particular Bodily Integrity." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 81-96. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Rosenbaum, David A. *Human Motor Control.* Second edition. Burlington, MA: Elsevier, 2010.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Rotter, Pawel, Barbara Daskala, and Ramon Compañó. "Passive Human ICT Implants: Risks and Possible Solutions." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 55-62. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Rowlands, Mark. *Can Animals Be Moral?* Oxford: Oxford University Press, 2012.

Royakkers, Lambèr, and Rinie van Est. "A literature review on new robotics: automation from love to war." *International journal of social robotics* 7, no. 5 (2015): 549-70.

Rozhok, Andrii. *Orientation and Navigation in Vertebrates.* Springer-Verlag Berlin Heidelberg, 2008.

Rugg, Michael D., Jeffrey D. Johnson, and Melina R. Uncapher. "Encoding and Retrieval in Episodic Memory: Insights from fMRI." In *The Wiley Handbook on the Cognitive Neuroscience of Memory*, edited by Donna Rose Addis, Morgan Barense, and Audrey Duarte, pp. 84-107. Malden, MA: John Wiley & Sons, 2015.

Rutherford, Andrew, Gerasimos Markopoulos, Davide Bruno, and Mirjam Brady-Van den Bos. "Long-Term Memory: Encoding to Retrieval." In *Cognitive Psychology*, second edition, edited by Nick Braisby and Angus Gellatly, pp. 229-65. Oxford: Oxford University Press, 2012.

Rutten, W. L. C., T. G. Ruardij, E. Marani, and B. H. Roelofsen. "Neural Networks on Chemically Patterned Electrode Arrays: Towards a Cultured Probe." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, pp. 547-54. Acta Neurochirurgica Supplements 97/2. Springer Vienna, 2007.

Rynes, Sara L., Barry Gerhart, and Kathleen A. Minette. "The importance of pay in employee motivation: Discrepancies between what people say and what they do." *Human Resource Management* 43, no. 4 (2004): 381-94.

Saha, S.K. *Introduction to Robotics.* New Delhi: Tata McGraw-Hill Publishing Company Limited, 2008.

Sakas, Damianos E., I. G. Panourias, B. A. Simpson, and E. S. Krames. "An Introduction to Operative Neuromodulation and Functional Neuroprosthetics, the New Frontiers of Clinical Neuroscience and Biotechnology." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, pp. 2-10. Acta Neurochirurgica Supplements 97/1. Springer Vienna, 2007.

Salvini, Pericle, Cecilia Laschi, and Paolo Dario. "From robotic tele-operation to tele-presence through natural interfaces." In *The First IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, 2006. BioRob 2006*, pp. 408-13. IEEE, 2006.

Sanchez, Justin C. *Neuroprosthetics: Principles and Applications.* Boca Raton: CRC Press, 2016.

Sandberg, Anders. "Ethics of brain emulations." *Journal of Experimental & Theoretical Artificial Intelligence* 26, no. 3 (2014): 439-57.

Sandor, Christian, Martin Fuchs, Alvaro Cassinelli, Hao Li, Richard Newcombe, Goshiro Yamamoto, and Steven Feiner. "Breaking the Barriers to True Augmented Reality." arXiv preprint, *arXiv:1512.05471 [cs.HC]*, December 17, 2015. http://arxiv.org/abs/1512.05471. Accessed January 25, 2016.

Sasse, Martina Angela, Sacha Brostoff, and Dirk Weirich. "Transforming the 'weakest link' – a human/computer interaction approach to usable and effective security." *BT technology journal* 19, no. 3 (2001): 122-31.

Sayood, Khalid. *Introduction to Data Compression.* Waltham, MA: Morgan Kaufmann, 2012.

Sayrafian-Pour, K., W.-B. Yang, J. Hagedorn, J. Terrill, K. Yekeh Yazdandoost, and K. Hamaguchi. "Channel Models for Medical Implant Communication." *International Journal of Wireless Information Networks* 17, no. 3-4 (December 9, 2010): 105-12.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Schermer, Maartje. "The Mind and the Machine. On the Conceptual and Moral Implications of Brain-Machine Interaction." *NanoEthics* 3, no. 3 (December 1, 2009): 217-30.

Schwartz, Bennett L. *Memory: Foundations and Applications.* Second edition. Thousand Oaks, CA: SAGE Publications, Inc., 2014.

"Security Risk Assessment Framework for Medical Devices." Washington, DC: Medical Device Privacy Consortium, 2014.

Self-Organizing Networks (SON): Self-Planning, Self-Optimization and Self-Healing for GSM, UMTS, and LTE, edited by Juan Ramiro and Khalid Hamied. Chichester: John Wiley & Sons Ltd., 2012.

Sensory Evolution on the Threshold: Adaptations in Secondarily Aquatic Vertebrates, edited by J.G.M. Thewissen and Sirpa Nummela. Berkeley: University of California Press, 2008.

Settle-Murphy, Nancy M. *Leading Effective Virtual Teams: Overcoming Time and Distance to Achieve Exceptional Results*. Boca Raton: CRC Press, 2012.

Shahinpoor, Mohsen, Kwang J. Kim, and Mehran Mojarrad. *Artificial Muscles: Applications of Advanced Polymeric Nanocomposites*. Boca Raton: Taylor & Francis, 2007.

Shekhar, Sandhya. *Managing the Reality of Virtual Organizations*. Springer India, 2016.

Sherwood, Lauralee. *Fundamentals of Human Physiology.* Fourth edition. Belmont, CA: Brooks/Cole, 2012.

Shoniregun, Charles A., Kudakwashe Dube, and Fredrick Mtenzi. "Introduction to E-Healthcare Information Security." In *Electronic Healthcare Information Security*, pp. 1-27. Advances in Information Security 53. Springer US, 2010.

Siegel, Allan, and Hreday Sapru. *Essential Neuroscience*. Baltimore: Lippincott Williams & Wilkins, 2006.

Siewert, Charles. "Consciousness and Intentionality." *The Stanford Encyclopedia of Philosophy* (Fall 2011 Edition), edited by Edward N. Zalta. http://plato.stanford.edu/archives/fall2011/entries/consciousness-intentionality/.

Siewiorek, Daniel, and Robert Swarz. *Reliable Computer Systems: Design and Evaluation*. Second edition. Burlington: Digital Press, 1992.

Sloman, Aaron. "Some Requirements for Human-like Robots: Why the recent over-emphasis on embodiment has held up progress." In *Creating brain-like intelligence*, pp. 248-77. Springer Berlin Heidelberg, 2009.

Smith, C.U.M., *Biology of Sensory Systems*. Second edition. Chichester: John Wiley & Sons Ltd., 2008.

Smolensky, Paul. "The constituent structure of connectionist mental states: A reply to Fodor and Pylyshyn." *The Southern Journal of Philosophy* 26, no. S1 (1988): 137-61.

Snider, Greg S. "Cortical Computing with Memristive Nanodevices." *SciDAC Review* 10 (2008): 58-65.

Snyder, Allan W., Elaine Mulcahy, Janet L. Taylor, D. John Mitchell, Perminder Sachdev, and Simon C. Gandevia. "Savant-like skills exposed in normal people by suppressing the left fronto-temporal lobe." *Journal of integrative neuroscience* 2, no. 02 (2003): 149-58.

Snyder, Allan. "Explaining and inducing savant skills: privileged access to lower level, less-processed information." *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 364, no. 1522 (2009): 1399-1405.

Social Robots and the Future of Social Relations, edited by Johanna Seibt, Raul Hakli, and Marco Nørskov. Amsterdam: IOS Press, 2014.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Social Robots from a Human Perspective, edited by Jane Vincent, Sakari Taipale, Bartolomeo Sapio, Giuseppe Lugano, and Leopoldina Fortunati. Springer International Publishing, 2015.

Social Robots: Boundaries, Potential, Challenges, edited by Marco Nørskov. Farnham: Ashgate Publishing, 2016.

Sohl-Dickstein, Jascha, Santani Teng, Benjamin M. Gaub, Chris C. Rodgers, Crystal Li, Michael R. DeWeese, and Nicol S. Harper. "A device for human ultrasonic echolocation." *IEEE Transactions on Biomedical Engineering* 62, no. 6 (2015): 1526-34.

Sosinsky, Barrie. *Networking Bible*. Indianapolis: Wiley Publishing Inc., 2009.

Soussou, Walid V., and Theodore W. Berger. "Cognitive and Emotional Neuroprostheses." In *Brain-Computer Interfaces*, pp. 109-23. Springer Netherlands, 2008.

"Spinal Cord Stimulation." American Association of Neurological Surgeons, October 2008. http://www.aans.org/Patient%20Information/Conditions%20and%20Treatments/Spinal%20Cord%20Stimulation.aspx. Accessed December 8, 2016.

Spohrer, Jim. "NBICS (Nano-Bio-Info-Cogno-Socio) Convergence to Improve Human Performance: Opportunities and Challenges." In *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science*, edited by M.C. Roco and W.S. Bainbridge, pp. 101-17. Arlington, VA: National Science Foundation, 2002.

Srinivasan, G. R. "Modeling the cosmic-ray-induced soft-error rate in integrated circuits: an overview." *IBM Journal of Research and Development* 40, no. 1 (1996): 77-89.

Stahl, B. C. "Responsible Computers? A Case for Ascribing Quasi-Responsibility to Computers Independent of Personhood or Agency." *Ethics and Information Technology* 8, no. 4 (2006): 205-13.

Stallings, William. *Cryptography and Network Security: Principles and Practice*. Seventh edition. Harlow: Pearson Education Limited, 2017.

Starr, Cecie, and Beverly McMillan. *Human Biology.* Eleventh edition. Boston: Cengage Learning, 2016.

Stelzer, Dirk. "Enterprise Architecture Principles: Literature Review and Research Directions." In *Service-Oriented Computing. ICSOC/ServiceWave 2009 Workshops*, pp. 12-21. Springer, 2010.

Stieglitz, Thomas. "Restoration of Neurological Functions by Neuroprosthetic Technologies: Future Prospects and Trends towards Micro-, Nano-, and Biohybrid Systems." In *Operative Neuromodulation*, edited by Damianos E. Sakas, Brian A. Simpson, and Elliot S. Krames, pp. 435-42. Acta Neurochirurgica Supplements 97/1. Springer Vienna, 2007.

Streib, James T. *Guide to Assembly Language: A Concise Introduction.* Springer-Verlag London Limited, 2011.

"Studies Find Disparities in Use of Deep Brain Stimulation." Parkinson's Disease Foundation, January 29, 2014. http://www.pdf.org/en/science_news/release/pr_1391019029. Accessed December 8, 2016.

Sundberg, Hakan P. "Building the Enterprise Architecture: A Bottom-Up Evolution?" In *Advances in Information Systems Development*, edited by Wita Wojtkowski, W. Gregory Wojtkowski, Jože Zupancic, Gabor Magyar, and Gabor Knapp, 287. Springer US, 2007.

"Surgeons Publish Study on Auditory Brainstem Implant Procedure." *The Hearing Review*, May 22, 2015. http://www.hearingreview.com/2015/05/surgeons-publish-study-auditory-brainstem-implant-procedure/. Accessed December 8, 2016.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Synaesthesia: Theoretical, artistic and scientific foundations, edited by María José de Córdoba Serrano, Dina Riccò, and Sean A. Day. Granada: International Foundation Artecittà Publishing, 2014.

Szoldra, P. "The government's top scientists have a plan to make military cyborgs." *Tech Insider*, January 22, 2016. http://www.techinsider.io/darpa-neural-interface-2016-1. Accessed May 6, 2016.

Talan, J. "DARPA: On the Hunt for Neuroprosthetics to Enhance Memory." *Neurology Today* 14, no. 20 (2014): 8-10.

Tang, Hao, Yun Fu, Jilin Tu, Mark Hasegawa-Johnson, and Thomas S. Huang. "Humanoid audio–visual avatar with emotive text-to-speech synthesis." *IEEE Transactions on multimedia* 10, no. 6 (2008): 969-81.

Targeted Muscle Reinnervation: A Neural Interface for Artificial Limbs, edited by Todd A. Kuiken, Aimee E. Schultz Feuser, and Ann K. Barlow. Boca Raton: CRC Press, 2014.

Tarín, C., L. Traver, P. Martí, and N. Cardona. "Wireless Communication Systems from the Perspective of Implantable Sensor Networks for Neural Signal Monitoring." In *Wireless Technology*, edited by S. Powell and J.P. Shim, pp. 177-201. Lecture Notes in Electrical Engineering 44. Springer US, 2009.

Taylor, N. R., and J. G. Taylor. "The Neural Networks for Language in the Brain: Creating LAD." In *Computational Models for Neuroscience*, edited by Robert Hecht-Nielsen and Thomas McKenna, pp. 245-65. Springer London, 2003.

Taylor, Annette Kujawski, "Hyperthymesia." In *Encyclopedia of Human Memory*, edited by Annette Kujawski Taylor, pp. 547-50. Santa Barbara: Greenwood, 2013.

Taylor, Dawn M. "Functional Electrical Stimulation and Rehabilitation Applications of BCIs." In *Brain-Computer Interfaces*, pp. 81-94. Springer Netherlands, 2008.

Taylor, Dawn M., Stephen I. Helms Tillery, and Andrew B. Schwartz. "Direct cortical control of 3D neuroprosthetic devices." *Science* 296, no. 5574 (2002): 1829-32.

Teng, Santani, and David Whitney. "The acuity of echolocation: spatial resolution in the sighted compared to expert performance." *Journal of visual impairment & blindness* 105, no. 1 (2011): 20-32.

Tennison, Michael N., and Jonathan D. Moreno. "Neuroscience, Ethics, and National Security: The State of the Art." *PLOS Biology*, March 20, 2012. http://dx.doi.org/10.1371/journal.pbio.1001289. Accessed December 5, 2016.

Thanos, Solon, P. Heiduschka, and T. Stupp. "Implantable Visual Prostheses." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, pp. 465-72. Acta Neurochirurgica Supplements 97/2. Springer Vienna, 2007.

Thornton, Stephanie. *Understanding Human Development: Biological, Social and Psychological Processes from Conception to Adult Life*. New York: Palgrave Macmillan, 2008.

Thorpe, Julie, Paul C. van Oorschot, and Anil Somayaji. "Pass-thoughts: authenticating with our minds." In *Proceedings of the 2005 Workshop on New Security Paradigms*, pp. 45-56. ACM, 2005.

TOGAF® Version 9.1. Berkshire: The Open Group, 2011.

Tomas, David. "Feedback and Cybernetics: Reimaging the Body in the Age of the Cyborg." In *Cyberspace, Cyberbodies, Cyberpunk: Cultures of Technological Embodiment*, edited by Mike Featherstone and Roger Burrows, pp. 21-43. London: SAGE Publications, 1995.

Transcranial Magnetic Stimulation in Clinical Psychiatry, edited by Mark S. George and Robert H. Belmaker. Washington, DC: American Psychiatric Publishing, Inc., 2007.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Treffert, Darold A. "Accidental Genius." *Scientific American* 311, no. 2 (2014): 52-57.

Treffert, Darold A. "The savant syndrome: an extraordinary condition. A synopsis: past, present, future." *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 364, no. 1522 (2009): 1351-57.

Troyk, Philip R., and Stuart F. Cogan. "Sensory Neural Prostheses." In *Neural Engineering*, edited by Bin He, pp. 1-48. Bioelectric Engineering. Springer US, 2005.

Turner, Patrick, John Gøtze, and Peter Bernus. "Architecting the Firm – Coherency and Consistency in Managing the Enterprise." In *On the Move to Meaningful Internet Systems: OTM 2009 Workshops*, edited by Robert Meersman, Pilar Herrero, and Tharam Dillon, pp. 162-71. Lecture Notes in Computer Science 5872. Springer Berlin Heidelberg, 2009.

Upper Motor Neurone Syndrome and Spasticity: Clinical Management and Neurophysiology, second edition, edited by Michael P. Barnes and Garth R. Johnson. Cambridge: Cambridge University Press, 2008.

Van den Berg, Bibi. "Pieces of Me: On Identity and Information and Communications Technology Implants." In *Human ICT Implants: Technical, Legal and Ethical Considerations*, edited by Mark N. Gasson, Eleni Kosta, and Diana M. Bowman, pp. 159-73. Information Technology and Law Series 23. T. M. C. Asser Press, 2012.

Van der Raadt, Bas and Hans van Vliet. "Assessing the Efficiency of the Enterprise Architecture Function." In *Advances in Enterprise Engineering II*, edited by Erik Proper, Frank Harmsen, and Jan L. G. Dietz, 63. Lecture Notes in Business Information Processing 28. Springer Berlin Heidelberg, 2009.

Van der Torre, Leendert, Marc M. Lankhorst, Hugo ter Doest, Jan T. P. Campschroer, and Farhad Arbab. "Landscape Maps for Enterprise Architectures." In *Advanced Information Systems Engineering*, edited by Eric Dubois and Klaus Pohl. Lecture Notes in Computer Science 4001. Springer Berlin Heidelberg, 2006.

Van Drongelen, Wim, Hyong C. Lee, and Kurt E. Hecox. "Seizure Prediction in Epilepsy." In *Neural Engineering*, edited by Bin He, pp. 389-419. Bioelectric Engineering. Springer US, 2005.

Vänni, Kimmo J., and Annina K. Korpela. "Role of Social Robotics in Supporting Employees and Advancing Productivity." In *Social Robotics*, pp. 674-83. Springer International Publishing, 2015.

Versace, Massimiliano, and Ben Chandler. "The Brain of a New Machine." *IEEE spectrum* 47, no. 12 (2010): 30-37.

Vinciarelli, A., M. Pantic, D. Heylen, C. Pelachaud, I. Poggi, F. D'Errico, and M. Schröder. "Bridging the Gap between Social Animal and Unsocial Machine: A survey of Social Signal Processing." *IEEE Transactions on Affective Computing* 3:1 (January-March 2012): 69-87.

Viola, M. V., and Aristides A. Patrinos. "A Neuroprosthesis for Restoring Sight." In *Operative Neuromodulation*, edited by Damianos E. Sakas and Brian A. Simpson, pp. 481-86. Acta Neurochirurgica Supplements 97/2. Springer Vienna, 2007.

Virtual Organizations: Systems and Practices, edited by Luis M. Camarinha-Matos, Hamideh Afsarmanesh, and Martin Ollus. Boston: Springer Science+Business Media, 2005.

Wallach, Wendell, and Colin Allen. *Moral machines: Teaching robots right from wrong.* Oxford University Press, 2008.

Warwick, K. "The Cyborg Revolution." *Nanoethics* 8 (2014): 263-73.

Warwick, K., and M. Gasson. "Implantable Computing." In *Digital Human Modeling*, edited by Y. Cai, pp. 1-16. Lecture Notes in Computer Science 4650. Berlin/Heidelberg: Springer, 2008.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Weiland, James D., Wentai Liu, and Mark S. Humayun. "Retinal Prosthesis." *Annual Review of Biomedical Engineering* 7, no. 1 (2005): 361-401.

Weinberger, Sharon. "Pentagon to Merge Next-Gen Binoculars with Soldiers' Brains." *Wired*, May 1, 2007. https://www.wired.com/2007/05/binoculars/. Accessed December 5, 2016.

Weiss, Simon, and Robert Winter. "Development of Measurement Items for the Institutionalization of Enterprise Architecture Management in Organizations." In *Trends in Enterprise Architecture Research and Practice-Driven Research on Enterprise Transformation*, edited by Stephan Aier, Mathias Ekstedt, Florian Matthes, Erik Proper, and Jorge L. Sanz, pp. 268-83. Lecture Notes in Business Information Processing 131. Springer Berlin Heidelberg, 2012.

Wells, M.J. *Octopus: Physiology and Behaviour of an Advanced Invertebrate*. Springer Netherlands, 1978.

Westlake, Philip R. "The possibilities of neural holographic processes within the brain." *Biological Cybernetics* 7, no. 4 (1970): 129-53.

White, Stephen E. "Brave new world: Neurowarfare and the limits of international humanitarian law." *Cornell International Law Journal* 41 (2008): 177.

Widge, A.S., C.T. Moritz, and Y. Matsuoka. "Direct Neural Control of Anatomically Correct Robotic Hands." In *Brain-Computer Interfaces*, edited by D.S. Tan and A. Nijholt, pp. 105-19. Human-Computer Interaction Series. London: Springer, 2010.

Wiener, Norbert. *Cybernetics: Or Control and Communication in the Animal and the Machine*, second edition. Cambridge, MA: The MIT Press, 1961. [Quid Pro ebook edition for Kindle, 2015.]

Wilkinson, Jeff, and Scott Hareland. "A cautionary tale of soft errors induced by SRAM packaging materials." *IEEE Transactions on Device and Materials Reliability* 5, no. 3 (2005): 428-33.

Williams, Theodore J., and Hong Li. "PERA and GERAM – Enterprise Reference Architectures in Enterprise Integration." In *Information Infrastructure Systems for Manufacturing II*, edited by John J. Mills and Fumihiko Kimura, pp. 3-30. IFIP – The International Federation for Information Processing 16. Springer US, 1999.

Wilson, Margaret. "Six views of embodied cognition." *Psychonomic bulletin & review* 9, no. 4 (2002): 625-36.

Wise, Kensall D., Amir M. Sodagar, Ying Yao, Mayurachat Ning Gulari, Gayatri E. Perlin, and Khalil Najafi. "Microelectrodes, microelectronics, and implantable neural microsystems." *Proceedings of the IEEE* 96, no. 7 (2008): 1184-1202.

Wise, Kensall D., D. J. Anderson, J. F. Hetke, D. R. Kipke, and K. Najafi. "Wireless implantable microsystems: high-density electronic interfaces to the nervous system." *Proceedings of the IEEE* 92, no. 1 (2004): 76-97.

Woisetschläger, David M. "Consumer Perceptions of Automated Driving Technologies: An Examination of Use Cases and Branding Strategies." In *Autonomous Driving*, pp. 687-706. Springer Berlin Heidelberg, 2016.

Wolf-Meyer, Matthew. "Fantasies of extremes: Sports, war and the science of sleep." *BioSocieties* 4, no. 2 (2009): 257-71.

Wooldridge, M., and N. R. Jennings. "Intelligent agents: Theory and practice." *The Knowledge Engineering Review*, 10(2) (1995): 115-52.

Yampolskiy, Roman V. "The Universe of Minds." arXiv preprint, *arXiv:1410.0369 [cs.AI]*, October 1, 2014. http://arxiv.org/abs/1410.0369. Accessed January 25, 2016.

Yonck, Richard. "Toward a standard metric of machine intelligence." *World Future Review* 4, no. 2 (2012): 61-70.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).

Zebda, Abdelkader, S. Cosnier, J.-P. Alcaraz, M. Holzinger, A. Le Goff, C. Gondran, F. Boucher, F. Giroud, K. Gorgy, H. Lamraoui, and P. Cinquin. "Single glucose biofuel cells implanted in rats power electronic devices." *Scientific Reports* 3, article 1516 (2013).

Zhao, QiBin, LiQing Zhang, and Andrzej Cichocki. "EEG-Based Asynchronous BCI Control of a Car in 3D Virtual Reality Environments." *Chinese Science Bulletin* 54, no. 1 (January 11, 2009): 78-87.

Zofi, Yael. *A Manager's Guide to Virtual Teams.* New York: American Management Association, 2012.

Zullo, Letizia, German Sumbre, Claudio Agnisola, Tamar Flash, and Binyamin Hochner. "Non-somatotopic organization of the higher motor centers in octopus." *Current Biology* 19, no. 19 (2009): 1632-36.

"An Introduction to Enterprise Architecture in the Context of Technological Posthumanization,"
Chapter Five in Gladden, Matthew E., Neuroprosthetic Supersystems Architecture, pp. 182-209. Indianapolis: Synthypnion Academic, 2017.
ISBN 978-1-944373-07-8 (print edition) and 978-1-944373-08-5 (ebook).