# INFORMATION, COMMUNICATION, AND TECHNOLOGY: LIKE INDUSTRY, LIKE ACADEMIA?

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## ABSTRACT

This paper is a comparative analysis of information, communication, and technology (ICT) in industry and academia. A context is provided for the discussion and the terms used are defined. Productivity models are used to compare ICT in industry and academia. The comparison evokes possible outcomes related to the convergence of ICT as a discipline with other disciplines in academia. The argument is made that just as ICT is the core of industry, ICT is the communal foundation for academic disciplines, and also that a convergence of disciplines with ICT theory will increase productivity and reduce the academic silo effect. The purpose is to bring the interdisciplinary conversation to the forefront and consider the future of academia.

## INTRODUCTION

Throughout the evolution of the digital age, a number of organizations have failed to see the necessity of blending their business models with the ever-changing forms of technology and information transfer. Businesses must incorporate knowledge from the fields of information, communication, and technology (ICT) into what they do and who they are as a business. In essence, a business must become interdisciplinary. The failure to do this has led to the collapse of a variety of businesses. Modern organizations (profit and nonprofit), such as banks and educational institutions, must offer online services to remain competitive. The necessity of online services exists from a business standpoint and the topic is dealt with regularly in business and academic literature. But does the same necessity exist from a purely academic standpoint? Will academicians or academic programs that fail to harness the interdisciplinary approach of combining the academic field(s) of ICT with their fields suffer the same fate?

With the spread of the academic field(s) of ICT, academic productivity has the potential to grow and, at the same time, may demote the academic silo effect. This paper has two main objectives with regard to this statement: first, defining the terms at play so as to clarify the

meaning of the statement; second, further illustrating the meaning by comparing ICT impact in industry and academia—including the discussing of ICT within the context of productivity models. The purpose is to stir discussion concerning the fundamental components of both industry and academia and to theorize about the fate of noninterdisciplinary academic programs.

## FUNDAMENTALS AND TERMINOLOGY

In order to properly address this issue, I stress the recognition of certain facts: (1) all academicians and disciplines use technology, be it pen and paper or computer and the Web; (2) all academicians and disciplines rely on communication for survival, such as publication and teaching courses; (3) information is something all academicians and disciplines possess. Therefore, I argue that knowledge of ICT is fundamental to all academicians and disciplines. Here, knowledge means the theoretical or practical understanding of a subject. Yet, how many academicians, departments, or programs emphasize such an approach to their fields of study?

Though writers define information in a number of ways, I define it as *symbols that convey meaning*—including meaning beyond the "signified" or "object" by a "signifier" or "representamen" as defined in the field of semiotics (Chandler, 2007, pp. 14, 30). I use the term *symbols* in the broadest sense possible, making it inclusive of anything observable by the senses: writing, images (visuals), sounds, smells, tastes, objects, and behavior. Communication is a form of transmission that takes place between a sender and a receiver. With the Latin term *communis* being the root of this word, I place emphasis on the inferred relationship between sender and receiver. Consider communication within the context of *communis derivativus:* common, community, commune, communal, communion. Information and communication technologies are tools or mechanisms that support the conveying of information. In this sense, technology is a means of information conveyance. *Convey* is an appropriate term since it embodies both the transportation (e.g., storing) and the process of communicating (e.g., presenting) information.

Anthony Debons (2008) has defined information as "that which is in our heads . . . and that which is produced physically from such," but also states the "common view" that information is structured data (p. 4). Either way, this should sound familiar to all academicians. We (academicians) have thoughts, the goal being to substantiate and communicate them to others in an academic setting or via academic means, which requires the use of technology. The result is physical manifestations such as courses, lectures, seminars, visualizations, articles, books, and so on. In most cases, these items, which might be called meaning symbols, are also structured. Thus, I use the term ICT in this paper in light of these individual definitions and as a fundamental concept that collectively relates information, communication and technology. Also, ICT has given rise to a genus of academic fields, so when I refer to ICT as an academic discipline, it is inclusive of various methods/programs of study so long as they emphasize the three major components throughout the program of study (undergraduate/graduate) or as a theoretical foundation (research/academe).

Productivity as defined by the *New Oxford American Dictionary* is "the effectiveness of productive effort." Productivity is also a tangible outcome that is measurable by comparing inputs and outputs, whatever those may be in a given system. Academic productivity is a collective term that emphasizes the unified purpose and efficient output of academe as opposed to that of any single academician. Silos, to borrow a term from the management information systems world, are systems, data-stores, departments or even people that operate in isolation

from others. The academic claim I present for discussion in this paper is: the interdisciplinary approach of combining academic fields with the field(s) of ICT will support the growth of meaningful knowledge for academe and facilitate effective output (productivity) while decreasing isolated operation (silo effect).

## LIKE INDUSTRY?

Information, communication, and technology, as objects and means, have had and continue to have a profound influence on the business world. What follows is a survey of this phenomenon, which provides grounds for comparing ICT in business to ICT as a discipline in the academic world. In the case of industry, the influence is in the practical sense—the use of ICT; in the case of academia, the influence is in the theoretical sense—the study of ICT. Some researchers might argue that a direct comparison between industry and academia is a less-than-optimal approach based on the differing fundamental purpose of the two worlds and the fact that industry is based on practical use and academia is based on theoretical study. However, the two realms may be seen to exist for the promotion of each other, and their fates are inextricably intertwined in the modern world. Additionally, industry and academia are more alike than some researchers would be willing to admit. Industry and academia are both worlds composed of semiotics, economics, politics, ethics, and abstract frames. ICT, as a universal catalyst and a setting, invokes change in both worlds and, as we might conclude, is the foundation of both worlds—what Khun (1996) might call a paradigm upon which they are built. As for ICT use versus ICT study, the idea offered here is that they are hermeneutical (Heidegger, 1962); that is, they are both texts that comprise parts of a whole and contribute to the larger understanding of ICT and its universal impacts.

Information is something all organizations possess, and information is one of the most valuable assets of an organization. Businesses rely on communication for survival, communication between organization and customer, manager and subordinate, organization and employee, and organization and organization. A business must communicate information, and this necessity finds a solution through technology. All modern industries use and are impacted by technology, and businesses must use technology as a means of communicating information. Without information, communication of information, and technology for communicating information, a business is of little value. For example, a bank would not survive in the marketplace if it did not have technology in place to facilitate the information communication that is online banking. Thus, ICT is at the core of business.

Organizations invest in emerging information and communication technology because they believe it will contribute to productivity. Other technologies in the past, such as railroads, steam engines, and the telegraph, boosted productivity (Carr, 2003). But organizations have to be careful so as to maintain a "productive" input:output ratio, assuming ICT is a commodity input. And profit-maximizing firms should not expect that all ICT investments will improve productivity (Thatcher & Pingry, 2007). Overinvesting in information and communication technologies has the potential to be just as destructive as beneficial. Carr (2003) has argued that IT (ICT) of an infrastructural nature "offers far more value when shared than when used in isolation" (p. 42). Depending on the organization, internal and/or external ICT sharing could result in added value. The argument also implies that the silo effect is a bad outcome and will not increase productivity for the organization. Fritz Machlup brings the same thought to the level of information itself. He has stated that the value of information is tied to its distribution

(Debons, 2008, p. 174). Some information may be more valuable if it is siloed, whereas some information may be more valuable if shared. Either way, information and the technologies that support it, and its conveyance, have the potential to boost or limit productivity in industry.

Productivity and ICT usage in industry are addressable with all four of the Bolman-Deal organizational frames, but Bolman and Deal (2008) have given particular attention to productivity within the Human Resource frame. This will be important later when considering ICT in academia. If an organization wants to facilitate productivity, then employee engagement must be of primary concern. Information and its conveyance to members of the organization are necessary for empowerment and relationship building—necessary, but not fully sufficient (Bolman & Deal, 2008, p. 150). In some way, the work itself must breed productivity by its characteristics and influence. And the work must be participatory, which has been shown to be a powerful way of increasing productivity (p. 151). This can be facilitated by the use of ICT. Through the proper organizational usage and application of ICT, employees can feel engaged, informed, and truly a part of the "family." Thus, a potential outcome is a higher level of productivity.

We can also consider productivity within a model provided by Thatcher and Pingry (2007). According to their research, productivity is not an outcome of all ICT investments and is dependent on products the ICT supports (digital vs. traditional), market structure the firm competes within (monopoly vs. competition), and the type of ICT (design tools vs. production/distribution tools). Using their model, productivity is positively influenced in a couple of cases: in both market structures when the investment is in production tools for traditional products. Thatcher and Pingry used the example of airlines investing in check-in kiosks, and in Vancouver this resulted in more than a 100% decrease in check-in time and "enabling the airport to handle 20% more travelers with 30% fewer staff" (p. 43). There is also a chance of improved productivity with an ICT investment in design tools for traditional products within a competitive market, which is dependent upon the product(s) being highly differentiated.

Many modern organizations have used ICT in an attempt to further productivity, while at the same time maintaining a certain level of reservation in the use of some technologies or information distribution. For example, consider a software development firm. Like any other organization, it would use ICT to publish a website that advertises the company, its products, and its services. Perhaps the firm would put systems in place that allow approved developers to work remotely in an effort to promote autonomy and higher productivity. The firm would likely share information with vendors and sales representatives. But, at the same time, certain information requires siloing (e.g., customer records), and there are certain technologies the firm may not invest in because of security concerns over information distribution (e.g., source code, employee records). Also, ICT systems that allow for remote "autonomous" and "productive" work can silo employees by encouraging a form of external functionality. So to an extent, there will always be an undulating level of both productivity and the silo effect with respect to organizational use of information, communication, and technology.

Still, regardless of the level of productivity or siloing, businesses that do not adapt to the use or influence of ICT will find themselves struggling to survive. This is also true of companies that produce ICT products and services. Examples of poor ICT adaptation directly in the computing industry are Digital Equipment Corporation (DEC) and Compaq. Examples from other areas of industry are Blockbuster and Borders. In the latter cases, the businesses failed to understand and adapt to the changing marketplace, particularly with respect to methods of information transfer (e.g., product delivery). Was the failure in the use of ICT or the understanding of ICT? In essence, these questions are the same.

Businesses, as entities, must become professionals at information, communication, and technology. Professionals, meaning businesses, must master the creation and management of information and its communication via technology. And as I have already implied, in reality ICT is the primary business of industry in the modern marketplace, not the physical manifestations of business information known as products and services. The evidence is the growth in business investment in information and communication technologies in the past several decades (Carr, 2003). Not only that, but an entire science and accompanying library of literature have evolved around the convergence of these terms. Dozens of theoretical models have been developed in an effort to better understand the ICT world ("Theories Used in IS Research," n.d.). The result is that a business without a deep understanding and appropriate usage of ICT is out of business, or will be soon.

## LIKE ACADEMIA?

In his seminal 1988 article on the convergence of information and communication, James Beniger concluded that "information and communication continue to be the focus of a growing pan-disciplinary convergence of theory," but at the same time, formal fields sometimes remain in isolation, particularly communication (p. 213). The point is that formal disciplines have the tendency to rely on "inbred" knowledge and continue unaware of the developments in other disciplines. As in industry, this poses a considerable threat. I have already argued that information, communication, and technology are at the core of every academician and field, whether it is realized or not. The question is then whether a convergence of the discipline(s) of ICT with other disciplines will enhance academic productivity and reduce the silo effect between disciplines. Additionally, will a failure to do so result in the collapse of programs and departments?

In a revisit of the Bolman-Deal (2008) Human Resource frame, to facilitate productivity personal engagement must be of primary concern. The activity itself must breed productivity by its characteristics and influence, and the activity must be participatory. Engagement should already be a priority of academicians, but with a deeper understanding of ICT, methods of interdisciplinary engagement have the potential to improve. This means academician engagement with undergraduates, graduates, the academic community, and the professional world. Academic work already has the goal of productivity, but often in a siloed sense such as reading, writing, teaching, and publishing via strict disciplinary avenues. Maynard Mack (1983), in reference to the narrowing of intellect in the humanities, has stated that "we communicate with fewer and fewer [people] because it is easier to jabber in jargon than to explain a complicated matter in the real language of men" (p. 10). Two questions protrude from this statement. Has the situation changed since 1983? And, what is the real language of men? Mack evinced the answer by use of the terms "communicate" and "language." The real language of men is information, the communication of information, and the technique for doing so.

Academicians could overcome discipline barriers by accepting a collective understanding of what is the center of all disciplines: ICT. Beniger (1988) recognized this convergence in academic literature, and I must reemphasize and encourage the convergence. Even if the convergence of disciplines around information and communication continues, knowledge and regular discussion of the convergence is necessary. This means a focused integration of ICT into academic departments and programs. This could build a network of possibilities and raise the profile of interdisciplinary journals and scholarly work. As academicians with varying

interests are allowed to explore beyond traditional lines, participation could increase, resulting in heightened interaction and collaboration. The silos would transition from information stores to information distributors. Thus, recognition of ICT's inherent place within disciplines and the necessity for study across disciplines carries the potential outcome of a higher level of academic productivity.

ICT in academia is infrastructural. According to Carr (2003), there is more value in the sharing of infrastructural ICT in industry. If ICT is the common thread across disciplines, the sharing of ICT theory and application will yield value. Referring back to the model provided by Thatcher and Pingry (2007), I place academia in the market structure with the best potential for productivity: a competitive market. Not only that, but academic products are highly differentiated, in both form and stance. Academia is a sphere that allows for open debate and collaboration. Within this sphere, academicians strive and contend for the permeation of their ideas and understanding, whether theoretical or empirical. What academicians must realize is that the sphere is a construction of ICT. The ICT elements are the composition and the facilitation for productivity in every discipline. Siloing, functioning in a limited space, or focusing on proprietary (disciplinary) investment only, could result in the weakening of the "firm," just as it does in industry. Alternatively, sharing and collective examination of the topics of information, communication, and technology could actively strengthen the academic sphere.

This fundamental relationship with ICT means all disciplines are inherently interdisciplinary. Therefore, academicians, departments and programs need to reflect this reality. *Interdisciplinary* is a hot word in academia, but it is variable in meaning. Commonly, when a program or department claims to be interdisciplinary, there is a limit to the scope. Usually this limitation is within the home realm of the humanities or sciences. Examples are psychology and education, computer science and economics, history and philosophy, engineering and physics, even information systems and communication. To be truly interdisciplinary, a program, department, or academician must acknowledge a communal theoretical foundation, which ties disciplines together, and then incorporate the foundation into study. Information, communication, and technology are a foundation and, taken together, are already interdisciplinary. ICT is the communal foundation of academia. Communication is traditionally found in the humanities, technology in the sciences, and information scattered throughout both. Recognition of this, coupled with the convergence of study, would allow for a truly interdisciplinary experience across any disciplines. Examples are computer science and philosophy, physics and psychology, and history and information systems. A failure to converge will encourage the academic silo effect and could result in the collapse of programs.

Some academicians might think such a collapse is impossible, but so did the businesses discussed earlier. Remember, whether world empires, businesses, or academic factions, they all rise and fall. The warning to burgeoning fields is that autonomous growth is short-term. And there is little disagreement about whether or not problems exist, which is particularly true in the humanities, but also in the sciences. There are many sources that expound upon the "crisis" in the humanities throughout the past several decades, from *A Report on the Humanities in Higher Education* (Bennett, 1984) to *Literature, Science, and a New Humanities* (Gottschall, 2008). Similar crises exist in the sciences as evidenced by decreases in enrollments post-2000 in fields such as computer science, engineering, and information systems/technology (Granger, Dick, Jacobson, & Slyke, 2007; Zweben, 2011). Proposed solutions include an interdisciplinary approach between the sciences and humanities (Gottschall, 2008; Granger et al., 2007; Hall, 2011). What makes this difficult is the disciplinary siloing and jargon. What will help in facilitating a coming-together of the humanities and sciences for the betterment of both is a common language. This common language is information, communication, and technology.

Such an approach warrants a word of caution. In industry, an overinvestment in or misuse of ICT can be destructive to the organization. In academia, overconvergence can result in an adverse effect on the discipline. Even though disciplines may have a common theoretical foundation, the spirit and focus of a discipline cannot be lost in a misappropriation of study. Indeed, the differences from discipline to discipline give breadth and depth to academe. The intellectual investments must also be the correct investments. As in industry, not all approaches will increase understanding or productivity. If programs, departments, or academicians implement changes, the changes should be made with the utmost sensitivity and with the intention of strengthening and preserving the discipline.

## CONCLUSION

Information, communication, and technology not only impact industry and academia; they are the core, the construction, of both worlds. Therefore, an examination of industry can give insight into academia and vice versa. The question explored throughout this paper was if an academic embrace of the interdisciplinary approach, specifically convergence with ICT, would benefit academe. Also, if a failure to do so would result in the demise of disciplines in academia, similar to the demise of businesses in industry. Productivity models illustrated the possible outcomes in both industry and academia when adopting ICT.

The conclusion is that all disciplines share a common foundation in ICT. Recognition of this interdisciplinary relationship, coupled with the integration of ICT study across disciplines, may facilitate academic productivity while decreasing the academic silo effect. A failure to do so may result in continued problems for a number of academic disciplines in both the sciences and the humanities. Academe should not see autonomy as a solution and should not encourage it by fostering disciplinary boundaries in research and knowledge dissemination. Still, academe should handle interdisciplinary changes with caution and respect for the disciplines. Hopefully, this comparative analysis will stimulate further discussion and invigorate the topic of disciplinary convergence.

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