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Informing as a Discipline: An Initial Proposal

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Abstract

This paper presents a structured view of informing as a separate field of scientific inquiry and practical endeavors and possibly an emerging academic discipline. It is already a field with its framework, model, a fundamental research question, a point of reference, observation points, and ways of measuring results. It entails basic distinctions, fundamental concepts, and a universal taxonomy and ordering of information use requirements and priorities for their examination for research and applications. It still lacks a clear division into sub-areas. To attain the status of a separate academic discipline, it needs further elaboration of sub-areas and a curriculum model that specifies competencies, an introductory course, prerequisite courses, and laboratories. This position paper is written mainly from the operations management and decision sciences viewpoint, structured similarly as computing, and discussed from the perspective of various taxonomies of academic disciplines. Its purpose is to elicit challenge, critique, discussion, and suggestions to develop a mutual consensus among researchers in informing.

Keywords: Informing, informing science, informing discipline, field of inquiry

Introduction

In 1982, adopting Nadler's (1982) terminology of work systems in industrial engineering, Gackowski gave the following definition: "***informing systems*** are a class of work systems whose **basic output** is **information** that affects recipients' actions" (1982, p. 108).

In 1999, Eli Cohen laid down the foundations of informing science and defined it as "the field of inquiry that attempts to provide a client with information in a form, format, and schedule that maximizes its effectiveness" (p. 5). Since that time, a separate field of informing science has emerged. It was fostered by the efforts of Eli Cohen, the founder of the Informing Science Institute, who established a tradition of annual international conferences, scientific and professional journals, and other forms of publication not horded but shared immediately without charge on the Web. The informing science framework encompasses Informing Environment, Information Delivery System, and Task Completion System.

Informing contributes to all realms of human endeavor. The 21st century is viewed an age of information. This paper examines:

1. Is informing is a separate field of inquiry and practical endeavors?
2. Is informing science a science?
3. Is it a separate field of scientific inquiry?
4. Is it a lasting quest or will it fade within a generation?

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5. What does informing need to become a separate academic discipline?

It seems that informing is a field of science, art, and practical endeavors aimed at increasing communications effectiveness. Information is recognized, at least by some, as the third essence that supplements matter and energy in viewing the universe; it describes its structural aspects represented by patterns. It is an intrinsic, thus always present and objectively observable, component of all physical systems that are ascribed to their organization or lack thereof (Stonier, 1997, p. 12). In its essence informing is spreading patterns in form among humans, robots, living entities, even inanimate matter (Gackowski, 2009). Thus, informing science is a transdisciplinary physical, life, and human science. As human science it aims at expanding one's control over reality by extension of knowledge, development, and operations within the praxiological triad: effectiveness, ethics, and/or efficiency (Gasparski, 1988).

De-psychologization of information and informing facilitates articulation of their scientific foundations; however psychology should never be excluded. The term ***science*** is used here as a system of knowledge in fields of inquiry with a well-defined scope: clear distinction of replicable entities and observable phenomena, relationships among them, their taxonomy, paradigms, and theory. It entails both unbiased and purpose-focused observations, systematic experimentation in pursuit of general truth, and the operating laws. Anything that can be subject to **replicability** with **results at a statistically significant level of confidence** is part of ***scientific knowledge;*** beyond this we deal with hypotheses, speculations, etc**.** Some of the latter may belong to individual or commonly shared beliefs, which are part of human culture, not science. Informing will also be discussed from the perspective of taxonomies of academic disciplines presented by Favero (2003), Kuhn (1996), and Biglan (1973).

Today, informing widely uses information technology (IT); nevertheless its use should always be subordinated to the purpose and circumstance of informing. IT is important, but not at the forefront, as it is in computing (Denning et al., 1989, p. 1) and computer-based management information systems (Ives, Hamilton, & Davis, 1980, p. 1), or evident in current MIS textbooks. Research at MIT (Huang, Lee, & Wang, 1999) reads,

> *Many best-practice reports witness that information technology alone is not the driver for knowledge management in companies today. … Information and knowledge experienced by members of an organization should be the focus, not the system or technology per se. Technology and systems ... are facilitators.* (p. 4)

In operations viewed through the lens of decision making, within the four Ms (Methods, Machines, Materials, Manpower), "Methods" stand out as pure factors in form—knowledge (information, data, rules of reasoning and proceeding) of routine and strategic role; nevertheless "Machines, Materials, and Manpower" are also objectified knowledge. Operations and research are conducted by autonomously purposively acting humans, their organizations, systems numerically controlled by programs and/or artificial intelligence (robots), and any combination thereof. In their planning and design, several of the concerns are identification and exploitation of information sources (informing entities); methods; techniques and means of collecting, acquiring, recognizing, and internalizing information for storing, processing, and retrieving information including its presentation to and utilization by users (entities informed).

Everything begins with observations and acquisition of knowledge. They play a paramount role in physical and life science and in education, business, administration, politics, propaganda, and military science. Informing has matured enough to justify a more rigorous description of its intellectual substance, to provide a better sense of purpose, framework, and guidelines. This position paper is written to elicit challenge, critique, and discussion aimed at building mutual consensus.

The main points of this paper are:

- a generalized concept of informing

- informing contrasted with its precursor, the widely used management information systems (MIS) approach (Ives et al., 1980)
- informing within a framework used for computing (Denning et al., 1989)
- the paradigms of informing
- a short description and definition of informing
- division of informing into major sub-areas
- informing within the major taxonomies of academic disciplines
- what informing lacks to become a separate academic discipline

For focused reading, key terms in paragraphs are in **bold** font, emphasis is in *italics,* highest emphasis is <u>underlined</u>, and terms followed by a definition are in ***bold italics***. The author is particularly indebted to the final report of the Task Force on the Core of Computer Science, authored by Denning et al. (1989) with many of its fine examples adopted here for informing.

Precursors of Informing

The Framework for Research in Computer-Based (C-B) Management Information Systems (Ives et al., 1980) is the closest proxy of informing although it does not address informing per se. However, it is more than a piece of research done in 1980; it served as the recognized framework for hundreds of doctoral dissertations in MIS; hence, it cannot be ignored. This framework entails three types of variables: **environmental variables** (constraints and resources), **information subsystem characteristics**, and **process variables** (performance measures). Certainly, environmental variables are factors in all endeavors. Let us review them.

Environmental variables represent resources, constraints, and opportunities that impact informing. Authors distinguish four classes of environmental variables: **external environment**, **organizational environment**, **user environment**, and **development environment**. The ***external environment*** includes legal, social, political, cultural, economic, educational, resource, and industry/trade considerations. The ***organizational environment*** is marked by management's philosophy, mission, strategy, structure, and goals. The ***user environment*** entails the primary acting entities informed (decision-makers, actors, agents), their tasks, staff members, and surroundings. The ***development environment*** consists of development methods and techniques, design personnel and their characteristics (education, experience, etc.), and the organization and management of development.

The information subsystem entails sets of usable and useful values of symbolic representations (data, information, and elements of knowledge) with pertinent use requirements (quality) over their entire multidimensional space, decision models, and algorithms in use.

Performance variables are prerequisites for quantitative research and measurable practical results. One needs here a testable purpose to measure effectiveness and efficiency. For instance, in computing, which serves here as analogy, storage space and computing time are defined as performance measures, including their tradeoffs.

Any model, to become a **rallying point** for a broader community of researchers yielding research results of **lasting validity,** should entail an explicitly or implicitly well-defined point of reference, observation point, and frame of reference. Informing should encompass any kind of informing (not limited to computer-based informing) that is focused on its own fundamental question as in computing (see section of this paper titled Paradigms of Informing).

The framework by Ives et al. (1980) covers only some elements of a vaguely defined frame of reference, leaving the rest (purpose and observation points) to researchers' discretion, thus, without objective criteria for assessing progress within the discipline. Their framework is not anchored in proven principles, which invites broad weakly focused empiricist research. In "*The Poverty of Empiricism,*" Mende (2005) warned: "in producing explanatory theories empirical methods are inherently useless" (p. 189).

The three classes of variables that explicitly pertain to the information subsystem try to address the 179+ dimensions of data/information quality identified a decade ago by Wang and Strong (1996). They are labeled information subsystem variables, an equivalent of the current dimensions of information quality; while de facto they are information use requirements. Most research views them as independent variables while they are strongly ***interdependent*** in many ways (Gackowski, 2004, 2009). This alone may contribute to fruitless empirical studies, which if not carefully designed rarely prove anything decisively.

The **process variables** proposed by Ives et al. (1980, p. 919) are controversial and overlap with variables of information use requirements. At that time, there was only foreboding of the vast problem of information quality as meant today. On the one hand, "*accuracy, source, age, scope, level of aggregation, and time horizon*" are among the information subsystem content variables, including "*presentation form* ", while on the other hand "*time of presentation*" and "*turnaround time, response time, availability, error rate*" are among the operations process variables. Today, they all are data and information use requirements subject to a universal impact-focused hierarchical disjointed taxonomy (Gackowski, 2009).

Some definitions and descriptions seem not to be coherent. "The process variables represent measures of the interactions" (between the information system and the environment), while in Exhibit 7, Five Categories of Information System Research, Ives et al. (1980, p.919) explain PROCESS VARIABLES as Performance Measures. The cited approach leaves the impression that MIS is an autonomous phenomenon in its own right, which requires research, but is devoid of any higher-level purpose. There is a single hint to "*effect on productivity*" and to an undefined "*decision-making quality*." Most of the measures refer to "*quality of work life,*" "*quality of life and satisfaction of secondary users, and the service to users,*" and "*participation, support, and satisfaction with the development effort.*" Such criteria suggest that MISs are developed, operated, and used for the welfare of the participants without focusing on business purposes.

Ives et al. claim that a major use of their framework is to generate relevant testable hypotheses for MIS research. Alas, the offered examples confirm Mende's (2005) paper "*The Poverty of Empiricism*" (p. 189). Only four (1.2%) of the 331 dissertations "*specifically develop performance measures for the development, operations or use processes … descriptions have been over used and discovery research has been underutilized*" (Ives et al., 1980, p. 930).

After 25 years since the model was published, it would be interesting to study how effective the framework has been. Without much risk, one may venture a double-whammy hypothesis: Over the last 25 years, as far as anecdotal evidence reflects reality, this framework was likely very productive in generating doctoral dissertations; nevertheless, only a few of them, if any, yielded research results of lasting validity in the discipline. A cursory survey of MIS textbooks seems to confirm it. If readers can find examples to the contrary, they will be carefully considered.

There is, however a representative example of what real break-through contributions to MIS suffer from authors of MIS textbooks. In 1968, Kofler defined and published the concept of ***utility value*** of information ***I*** as determined by the difference in the value of results of operations when acting with and without that information. In 1970, Alter defended his unpublished Ph.D. dissertation, titled "A study of Computer Aided Decision-making in Organizations," at the Massachusetts Institute of Technology. Judging by the reputation the Sloan School of Management enjoys in business disciplines (with information systems rated **number one)** by the deans and MBA program directors ("Best Colleges Specialty Rankings", n.d.), Alter is one of the brightest. Reviewers of this critique (Gackowski, 2004) of MIS textbooks (that are overly technology laden but lacking the fundamentals about data, information, and informing) cited Alter's textbook as an exception. Yes, more than 30 years after the concept of utility value of information was published, and more than 25 years after Alter defended his Ph.D., he also authored an MIS textbook, where one finds that the utility value of data/information is a concept that is "more elegant than practical" (Alter, 2002, p. 162).

The preceding example demonstrates how fundamentals of informing are presented to students of MIS in one of the better textbooks in this field. In other words, one of the key use requirements of information - "significant materiality" or utility value is still conspicuously absent in MIS textbooks. While "*materiality is a fundamental, central, and the most pervasive requirement related to use of all factors"* (Gackowski, 2009, p. 157), it is (a) **fundamental** as the only universally necessary use requirement that provides each factor with a sufficient reason to be considered in operations and it ranks all the factors, (b) **central** as because it is indispensable for all considerations about effectiveness and efficiency of operations, and (c) **the most pervasive** use requirement because it determines the materiality of the remaining necessary quality requirements of the same factor, it determines the materiality of its necessary companion factors in tasks, and, to a lesser degree, it affects the materiality of other factors related to it. In MIS textbooks, this concept is either ignored or marginalized as "more elegant than practical" by the brightest of them. One can see that real progress has a difficult time to trickle down to the educators' minds. Thus the transdisciplinary and interdisciplinary concept of informing emerged as a counter reaction to overemphasis of information technology in teaching management information systems.

Paradigms of Informing

This paper uses an analogous approach to informing as Denning et al. (1989) did in "Computing as a Discipline". The fundamental question underlying all of computing is "What can be automated?" Such a question, as difficult as the answer may be, can be answered relatively objectively because the answers are uninfluenced by emotions and individual bias. To the contrary, informing by its very nature is always some attempt to impose one entity's pattern on another entity. Among inanimate entities, it is deprived of emotions but not without a potential physical bias. Among living entities, one cannot even expect informing to be objective as it always explicitly and/or implicitly is biased by purpose, emotions, and ignorance of the informing entities and entities informed. Among humans, objective informing is a rare exception, not a rule according to the well-proven philosophical model of reality described by Schopenhauer in his opus vitae, "World as Will and Representation" (made available to English readers by Hamlyn, 1980). His world view is still valid in human endeavors where the drive for dominance is common.

Despite differences between computing and informing, one may similarly identify major paradigms of informing such as theory, modeling, planning, design, and implementation of solutions. They provide context for defining the discipline of informing

Theory for informing is rooted in philosophy in general, in political philosophy, political science, praxiology, sociology, psychology, operations research, management, and decision sciences. Following the approach taken by Denning et al. (1989, p. 2), the informing paradigm consists of four steps that are followed in developing a coherent valid theory: (1) characterize objects of study (definition), (2) hypothesize possible relationships among them (theorems), (3) determine whether the relationships are true (proof), and (4) interpret the results. One expects to iterate these steps when results do not confirm the theorems.

Modeling is an experimental scientific method. Here, the informing paradigm consists of four stages that are followed in the investigation of a phenomenon: (1) form a hypothesis, (2) construct a model and make a prediction, (3) design experiments and collect data, and (4) analyze results. One expects to iterate these steps when predictions significantly disagree with gathered evidence.

Planning is rooted in operations research and operations management. It is a conscious pursuit for channeling the energy of the human will and life force into satisfying needs or fulfilling desires; otherwise, the energy dissipates. Here, the informing paradigm consists of four stages that are followed before going into design of informing that addresses a specific problem or opportunity: (1) analyze needs, expectations, desires, the existing or emerging problems, and/or opportunities; (2) set vision, mission, and goals; (3) set strategy, doctrines, and policies; and (4) set procedures. One expects to iterate these steps until the plan satisfies the will of the decision-making body.

Design is rooted in engineering, which, in its advances and the growing affluence of population, reaches out also for the arts. The informing paradigm for design consists of five steps. They are followed when organizing informing to solve a given problem or benefit from an opportunity (e.g., *a new technology*): (1) state requirements, (2) conduct feasibility study, (3) state specifications for the most feasible version, (4) develop the informing system, and (5) prepare the organization, task force, and/or users for implementation of the design. One expects to iterate these steps when results of tests reveal that the design of the system or campaign of operations may not satisfactorily meet the stated requirements.

Implementation is also rooted in engineering practice. The informing paradigm for implementation consists of the following steps, which differ whether it is a one-time campaign or a system that will be routinely operated. They are followed when the implementation of informing has been decided. With IT-based informing systems, (1) convert all master files or tables into the designed format; (2) conduct extensive system testing with correct input test data, incorrect input test data, and with historical or live data (if possible) under different contingency provisions (mock tests for one-time campaigns) to the satisfaction of the project leader; and (3) conduct a final acceptance test of the system to the satisfaction of the chief executive decision maker to obtain sign-off of the informing project. One expects to iterate the last two steps of testing when the informing system does not meet the stated requirements and expectations, first of the project manager and second of the chief executive decision maker.

These paradigms are distinct from one another because the necessary competencies to follow them differ in those areas. **Theory** is concerned with the ability to describe and prove relationships among objects, events, and their properties. **Modeling** or abstraction is concerned with the ability to use those relationships to make predictions that can be compared with reality. **Planning** is concerned with the ability to set up a strategy for long-term and current operations, including their mission, objectives, goals, doctrines, and policies. **Design** is concerned with the ability to prepare a blueprint of the informing system and its construction. **Implementation** is concerned with the ultimate testing of the informing system and running it according to the design and changing circumstances. Applied mathematicians, informing scientists, planners, designers, architects, and project managers generally do not have many interchangeable skills. They require not only different mindsets but also different professional preparations.

Informing sits at the crossroads of political philosophy, praxiology, applied mathematics, operations research, operations management, business, and education. The major binding force is a common interest in experimentation, planning, design, and implementation of effective, ethical, and/or efficient informing.

All of the above however pertains to paradigms of intentional informing. It leaves out informing conducted without an articulated intent (e.g., in social recreational settings) that is hardwired into many biological systems. Unintentional informing also serves important purposes. It accompanies physical playfulness, search, discovery, adaptation that takes place during development of such recreational systems or simply relaxes the accumulated tensions and stress. Unintentional informing certainly is not subject that previous described paradigms. Maybe there are paradigms of informing that fit non-routine, low-structured situations; their articulation may be a challenging task. A vast collection of thoughts that pertain to search, discovery, and adaptation can be found in the scholarly book titled *Informing business: Research and education on a rugged landscape* (Gill, 2010).

Description and Short Definition of Informing

The *Oxford English Dictionary* defines discipline as "a branch of learning or scholarly instruction." Referring to the requirements Denning et al. (1989) listed for computing, a good definition of informing as an academic discipline should

1. be understandable by people outside the field
2. be a rallying point for people inside the field
3. be concrete and specific
4. elucidate the roots of the discipline
5. set forth fundamental questions and significant accomplishments in each of its areas

Informing is the science and art of practical endeavors to increase its effectiveness, ethics, and/or efficiency in extending knowledge and control over reality. Informing, to be considered a science, must be effective and replicable in its findings. It entails a systematic study of the content and form of representation of reality (information, data, significant relationships among them [associations and interdependencies], rules of reasoning and proceeding from the perspective of the purpose and circumstances of informing, its algorithmic processes, and the conditions of gathering, communicating, and using such representations. The discipline includes theory, modeling, planning, design, and implementation of applications. The fundamental question underlying all of informing is ***"What and how can informing contribute to extend knowledge and control reality?"***

The spatial and temporal boundaries (entry and exit points) of informing and the moments where the process begins and terminates are defined at its sources, where it originates, and the entities informed that adopt or internalize the information by recognizing and accepting it as potentially **actionable data** for use. Informing is transdisciplinary because it operates in all disciplines. At the same time, informing is also interdisciplinary, because informing processes always intersect with one or more disciplines at the source and the entity informed.

In the early 1980s, the emphasis on informing emerged as a reaction to an overemphasis of information technology in management information systems (MIS) and information systems (IS) as taught to students of business and public administration. Students could recite jargon and technical terms but could not explain the actual purpose of informing and information systems. Related textbooks offer an oversimplified coverage of the fundamentals in the role of information, data, and knowledge in human endeavors. Important research supports this view. Technology is not an end in itself; it is only a means. The multifaceted aspects of informing have been completely inundated by elaborate descriptions of information technology in all forms—its potential, with case studies of its application devoid of the fundamentals in solving the encountered problems and/or opportunities.

The roots of informing extend into rhetoric; theory of communication; philosophy and science; political philosophy, and political science in particular; education; journalism and mass communications; linguistics; marketing; psychology; sociology; human–computer communications; operations; organization; management; leadership; law; military science; process control; etc.—a real interdisciplinary mix. Informing develops a theory and methods that are applied later in planning, design, and implementation of practical applications.

Sub-areas of Informing

Denning et al. (1989, p. 5) believe that, to qualify as a sub-area, a segment of a discipline must satisfy four criteria: (1) underlying unity of the subject matter, (2) substantial theoretical component, (3) significant abstractions, and (4) important design and implementation issues, as described in more detail under paradigms. Each area should be identified with a research community or a set of related communities that sustains its own literature.

Initially, one may suggest subareas of informing that qualitatively differ in their approach and methodology such as:

- **Routine informing for routine human controlled operations** that provide sustenance for all human endeavors (especially studied by Gackowski, 2009)
- **Non-routine informing** for exploration, development, and strategic decision-making in ill-defined situations (especially studied by Gill, 2010)

One may also delineate sub-areas of informing by fields of human endeavors such as philosophy and science, political philosophy, education, operations research, business and public administration, operations management, process control, military science, gathering intelligence, health sciences, agriculture, and family and consumer science.

As in computing, in informing there are also some affinity groups where there is relevant literature, but these are not shown as separate sub-areas because they are basic concerns throughout the discipline of informing. For instance, data and information quality related to their use surfaces in all sub-areas. The same holds true for communications, knowledge, learning objects, human–computer communications, web-page design, decision support, expert support, reliability, and security.

Informing in Classifications of Disciplines

The purpose of this section is to provide the reader with acknowledged perspectives of viewing academic disciplines. According to Favero (2003), four frameworks of classing academic disciplines have drawn much of the focus of empirical studies of discipline differences: codification, level of paradigm development, level of consensus, the Biglan Model (1973), and the Becher's (1989) comparative review of discipline differences.

Codification refers to the condition whereby knowledge can be consolidated or codified into succinct and interdependent theoretical formulations. It describes a field's body of knowledge as opposed to behavioral attributes of scholarly activity. Codification implies a high–low consensus among scholars, however consensus is the result of codification; thus, consensus and codification overlap. For instance, if the community of the Editorial Board of Reviewers and other scholars of informing could agree on the initial definition of informing and a general schema, for instance Schema 1 (Gackowski, 2009), one could claim that informing has attained a high level of codification, hence consensus.

Paradigm development (defined by Kuhn, 1996) refers to the extent to which a discipline possesses a clearly defined *"academic law,"* an ordering of knowledge, and associated social structures. *"Mature sciences"* have clear and unambiguous ways of defining, ordering, and investigating knowledge. Again, the terms **paradigm development** and **consensus** are thought to be interchangeable, as they describe a common dimension of disciplinary fields: the extent of agreement about the structure of inquiry and the knowledge it produces. If we could agree on the proposed paradigms of informing (theory, modeling, planning, design, and implementation), guided by the fundamental question underlying all of informing (*"What and how informing can contribute to extend knowledge to control reality?"*), we could rightly claim that informing exhibits a high level of paradigm development.

Consensus implies unity of mind concerning elements of social structure and the practice of science, including theory, methods, techniques, and problems. The indicators of consensus in a field are absorption of the same literature; similar education and professional initiation; and cohesiveness in the community that promotes relatively full communications and unanimous professional judgment on scientific matters; and a shared set of goals, including the training of successors. According to the above indicators of consensus, informing can claim a shared set of goals. Informing intensively promotes communication of results and possesses well-developed venues for publishing the research results. If an agreement could be reached about the definition, paradigms, and fundamental question, informing may claim the existence of a unanimous professional judgment of scientific matters, including well-developed venues of publishing the research results.

The Biglan Model (1973) was derived from the taxonomy of academic disciplines based on the responses of faculty from a large public university and a private liberal arts college regarding their perceptions of the similarity of subject-matter areas. The taxonomy by Biglan uses three dimensions: (1) the degree to which a paradigm exists (paradigmatic or pre-paradigmatic or hard versus soft disciplines), (2) the extent to which the subject matter is practically applied (pure versus applied), and (3) involvement with living or inorganic (inanimate) matter (life versus non-life systems). Informing certainly fits into Biglan's clusters of academic areas as a **paradigmatic**, **hard-applied field of inquiry** into mainly **life systems,** however it is **pre-paradigmatic** with respect to other than intentional informing, if such paradigms can ever be articulated.

Again, when using **Becher's (1989) comparative review of discipline differences**, informing at its current state belongs to the *"hard-applied"* discipline group. With regard to *"nature of knowledge,"* informing is **purposive, paradigmatic, and concerned with mastery of the reality resulting in products/techniques**. However, **informing for routine operations** also contains elements that may class it partially into the *"hard-pure"* group. It is so because the *"nature of knowledge"* about informing is also **cumulative, concerned with universals, and resulting in discovery and explanation**.

Conclusions

This article presents structured thinking about informing as a separate but demonstrably transdisciplinary field of scientific inquiry and a separate academic discipline. Informing, defined from this perspective, is the science and art of practical endeavors to increase its effectiveness, ethics, and/or efficiency; it is an interdisciplinary applied science with components of universal validity that mark pure science (Biglan, 1973). As related to operations, it consists of a model, a fundamental research question, a point of reference, observation points, a yardstick, and unambiguous entry and exit points that delineate the boundaries of informing where they intersect with other disciplines. It entails basic distinctions; a frame of reference; primary and secondary necessary use requirements, some of them of universal validity; a universal taxonomy of at least nearly well-ordered factors in form, including requirements with regard to aspects of their quality; and corresponding properties. This taxonomy prioritizes research and examination of factors for practical purposes, with some first principia that operate as fundamental laws.

It lacks, however, a clear division into sub-areas. When applying the same criteria to informing as to computing (Denning et al., 1989), to attain the status of a separate academic discipline, informing needs elaborations of its sub-areas and a curriculum model that specifies competencies, an introductory course, prerequisite courses, and laboratories. At present, informing certainly constitutes a separate field of research and practical endeavors to extend knowledge and to improve effectiveness, ethics, and/or efficiency of controlling reality.

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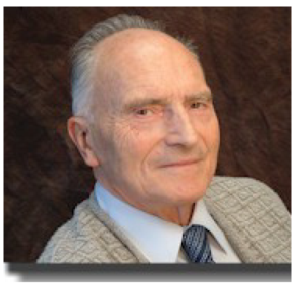
Biography



Zbigniew J Gackowski has experience in industry, public administration, and universities. His teaching and research bridge the gap between Central European and US experience in Computer Information Systems (Warsaw Polytechnic, The University of Michigan [*Fulbright Research Scholarship*], Purdue University [Visiting Associate Professor], Baruch College [Visiting Professor], CSU, Stanislaus [Professor], and the University of Melbourne [Visiting Professor]). His research has received much recognition. While in Poland, he published more than 120 items, among them 4 books and 6 papers in refereed journals and 12 papers presented across Europe, the United States, the Middle East, and South America. While in the USA, he taught at three USA universities, and wrote 32 research papers that were published in the proceedings of ASIS, ACM, WDSI, *Information Systems Educators Conference*, *The Informing Science Institute*, and the *International Conference on Information Quality* at MIT, 4 book chapters, and 1 scholarly book. He is a member of ACM and DSI and is a charter member of the *Association for Information Systems* and a founding member and an honorary fellow of *the Institute of Informing Science.*