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Ideologies of Information Systems and Technology

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1 Introduction

In this paper some views and ideologies of information systems and technology will be explored. Some of these views and ideologies are clearly understood and have a high level of support. There are however more subtle ideologies that are implicitly supported and practised that need to be scrutinized. Information systems and technology are often naively seen as objective, neutral tools in aid of humanity, when in fact they are in many cases instruments of domination that reduce human beings to a faceless class of standardized "users". The paper is intended to be controversial. It wants to address some of the long held believes; to stimulate information technology specialists into a more sensitive way of thinking. In the first part of the paper the concept of information systems and information technology will be discussed. In the second part of the paper some of the prevailing ideologies will be outlined and discussed.

2 Information System

A person's view of what an information system is, is largely determined by his view of information, and of the functioning thereof in the organization. The following two main metaphors for information systems will be explored:

- Information systems as functional entity
- Information systems as social systems

Information System as Functional Entity

From this perspective information systems are systems that objectively transform (examine, compare, classify etc.) confusing facts (data) into information, using a set of algorithms specified by a system designer or programmer. The algorithms are designed based on a set of requirements as expressed by a user (manager or operator). Here are two examples of this view:

> However, like raw talent or raw materials, raw data are of limited use. Only after these data have been examined, compared, classified, analyzed, and summarized do they become usable information and take on real value for management... Unprocessed facts and figures are data, not information. [10, p.436]

> The recorded transactions are called data. This raw data can be analyzed in various ways to meet the unique information needs of the organisation. Virtually any type of information can be produced from data. The data, however, represents thousands of facts, which, presented separately, would

Editor's Introduction

Readers who attended last year's conference of the Southern African Lecturers' Association will recall that the proceedings were dominated by a debate between Information Science lecturers on the nature of their disicpline. In order to make these views known to a wider audience, and in order to document some of the issues raised, two guest contributors, Lucas Introna and Trevor Crossman, were invited to articulate their respective perceptions on the nature of Information Systems. Both contributions affirm the technical nature as well as the social and ethical/moral demands of Information Systems. However, their perspectives differ in diagnosing the scope of the associated social and moral problems. At the risk of oversimplifying and reading too much in between the lines, I would suggest that the main difference is the following.

Introna sees information systems as social phenomena that cannot in any way (even with carefull management) be isolated from the social context. He states that "information technology *is* . . . a social and moral problem." He is suggesting that the problems are inherent. The question is how to deal with, constrain and manage these inherent problems.

Crossman, in apparent agreement, acknowledges that information systems brings in their wake "significant social and ethical consequences." However, these systems tend to be viewed as technical phenomena functioning in a social world: if managed correctly one can avoid the ethical and moral problems.

I shall leave it to readers to judge whether these interpretations accurately reflect the writers' respective positions.

Derrick Kourie, Editor

only confuse. The data must be processed to convert it into information. [1, p.147]

The following definition summarises this view:

> Information systems are systems (mostly computerized) that process (examine, compare, classify, analyze, and summarize) data to produce information that is utilized by users (managers and operators) in daily decision making, planning, controlling and execution

This view is based on the following basic set of assumptions and processes:

1. The user knows what is required. The user knows how to express this need in an unambiguous way. The user also knows how to utilize the output of the system (the information) in daily decision making, planning, controlling and execution. These needs are relatively stable and thus warrants automation.
2. It is the duty of the information specialist to objectively and in an unbiased way "capture" the user requirement by using rigorous, unambiguous, automated (if possible) methods and techniques of modelling and specification. The information specialist must not influence the process but must merely act as a mirror to reflect the requirement in the models and algorithms.
3. These objective and unambiguous models and specifications must then be translated into efficient algorithms to convert the pool of facts (data) into the information as required by the user. This information is objective (refined) facts produced by objective algorithms that can be trusted as a true picture (map) of the reality from which the data emanated.
4. If 1 to 3 succeed, the result will be an objective well functioning information system.
5. The information system consists of:
   - The procedures and input devices to capture the data
   - The hardware (and operating system) to provide the processing and communications capability
   - The application software to provide the algorithms (based on the requirements)
   - The output (reports, queries etc) produced by the algorithms on the output devices.
6. This information systems (and the process of developing it) functions in an environment that is rational, objective, ordered and apolitical.

This view is a widely accepted view of information systems and information systems development. The dominant metaphor of this view is the approximately deterministic and mechanistic world. In this world deterministic and mechanistic (thus technical) solutions will succeed [6]. The question that is raised is, "why, if the process of information systems development is so well defined, objective and rational, do we have so many dismal failures?"

It has been estimated that between 50–75% of all information systems development is never completed, or, if completed, never used [14]. How can such a seemingly simple technical process be so difficult to achieve? Is it a lack of tools and techniques or is it a fundamental misconception of the true nature of information systems? Is Tom DeMarco [5] not right in saying "... the major problems of our work are not so much technological as sociological in nature"?

Information System as Social Entity

When viewing the information systems as a social entity the focus shifts from processing to people; from algorithms to appropriation; from resource(input) to understanding(result); from hardware to peopleware. Information systems is not an end in itself, it is a means to an end. The end is to create information environments within which managers and users can make sense of their worlds. This end is to enable understanding, to provide for meaningful intervention in a chaotic and unpredictable world. In this view information systems can be defined as follows:

> Information systems are (social) systems of understanding where organizational "texts" (such as computer generated reports, memos, human produced reports, informal chats, etc) are appropriated as part of the daily sense-making of the individual in a chaotic and dynamic organizational environment. The purpose of the information system is to enable meaningful social intervention (decisions, actions, utterances, etc.)

In the creation (or in the design for creation) of these organizational "texts" the individual may know what is required, but because much of this knowledge is tacit, it is difficult to articulate [17]. Most of the articulation is ambiguous and relatively unstructured. The user only learns what is required as the articulation process develops. The information specialist must interpret these articulations (needs), that are in themselves ambiguous texts, in order to understand them. The individual and the information specialist must continually interpret and reinterpret each other's communication (texts). The need for computer generated "texts" is dynamic and changes continuously as the organizational context changes. The user may use the "texts" in many diverse ways–some of it merely to publically demonstrate seemingly rational behaviour and to serve some relevant political agenda.

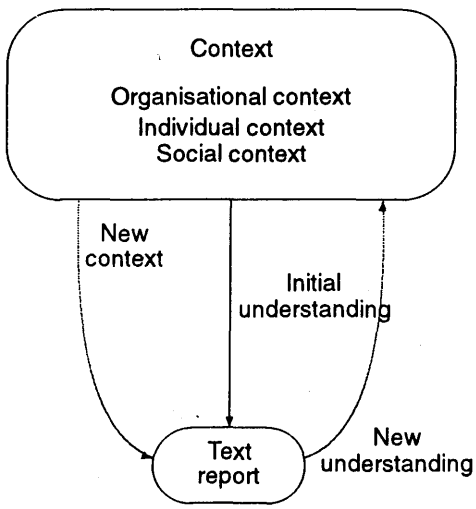
The process of interpretation of these organizational "texts" (design and system generated) is difficult and like most organizational communication, not trivial. With computer generated "texts" this interpretation process is complicated even more, as the text is dismembered from its context (the area or situation from which the data emanated). How does this interpretation (and thus appropriation) happen? What are the processes that drive it?

The process of interpretation is governed by the principles of hermeneutics. Hermeneutics is a science that developed around the problem of interpreting ancient texts (such as the bible). These principles of interpretation where later generalised into a broad philosophical system by Gadamer [11]. These principles has been applied in communication theory, social theory, literary criticism and may other diverse fields.

Hermeneutic understanding is not a removed intellectual or cognitive type of understanding, it is rooted in the

here and now, based on lived experience *(Erlebnis)*[1], and comes into being by means of the process of *appropriation* [12]. Appropriation is the actualization of meaning personal to someone, it "brings together", "equalises" and renders "contemporary", thus making one's *own* that which was initially *alien* [19]. Information seen in this way is "... part of a general 'sense-making' process and can be found in a distinctive way a person has come to understand the world" [4]. Understanding (and thus information) "must be conceived as part of the process of coming into being of meaning, in which the significance of all statements (data) is formed and made complete" [11].

The tacit process that realizes and drives the appropriation process is the hermeneutic circle. The concept of the hermeneutic circle asserts that the part (text) is determined by the whole (context) and the whole by the part. The hermeneutic circle starts in a heuristic manner. The interpreter uses his 'fore-understanding' and prejudices[2] to construe the initial meaning from the text (or data). He then relates this meaning to his current situation, tradition or context. He now possesses a new understanding of his context, this new understanding is projected back onto the text (or data) which opens up new meanings to be projected back to the context. This movement to and fro between text (or the part) and context (or the whole) creates possibilities for understanding, but only if the interpreter persists and continually opens himself to the text. The appropriation process via the hermeneutic circle can be viewed as follows:



The hermeneutic circle is, in a sense, the evolutionary process of coming into being of understanding. It starts with something known and evolves to something new (understanding). The hermeneutic circle highlights the contextual and perspectual nature of the appropriation or the understanding process (and as such of information). The iterative and contextual nature of the hermeneutic circle places very definite demands on the appropriation process. This implies that the process will not automatically succeed. Conditions for appropriation must be created [13]. Processed data without appropriation (and thus understanding) will stay data; will not become part of the sense-making process of the individual and thus, will not become part of the individual's decisions and actions. It will stay alien and be of no use (irrespective of the level of processing or abstraction). Thus appropriation is essentially the 'process' that 'converts' data into information. Appropriation is the bridge between the alien and the known, the essence of interpretation and thus of true understanding.

To define an information system in this manner is to place it back in its context. The fragmented view of information systems as a technical and functional entity ignored the real end of computerized information systems; to be part of the overall sense-making process of the individual. Information systems are thus not systems that are merely technically designed but environments that emerge based on the day-to-day interpretations and appropriations of each individual in the organization. From this perspective it is more useful to speak of information environments or information landscapes than of information systems.

Computerized information systems as social systems will only emerge if they become completely weaved into the web of organizational social life; not designed and constructed in some back room operation. As purely technical phenomena they will just continue to be bad statistics and major financial disasters. To define information systems as purely technical phenomena is the same as defining the creation of a novel as the process of processing many confusing facts and ideas into a story by using a word processing application. In doing this we would ignore the significance of the writer and the reader as part of what constitutes a novel. This would surely be absurd! We must not confuse the means with the end; the tool (or process) with the purpose.

3 Information Technology

Information systems as functional entities are dependent on information technology. What is the essence of information technology, or technology in general?

The Phenomenon of Technique

Jacques Elull [7] argues that technology can only be understood if one examines the phenomenon of technique. When one talks of technology, most people visualise machines. Technology is far more than synonymous to machines. Technology is the application of the logic of technique to a specific domain of human existence or endeavour.

What is the phenomenon or logic of technique? To answer this question one must first define the concept of method. When people do things to achieve known or defined ends, especially things they do often, they devise a method for doing it. A method can be said to be a sequence of steps or actions designed to achieve a defined result.

[1] The principle of *Erlebnis* (lived experience) "contains the infinitely important element that in order to accept a content as true, the man himself must be present or, more precisely, he must find the content in unity and combined with the certainty of himself" – Hegel in [11]

[2] The word prejudice must not be seen in a negative sense. It is used merely to describe the "first stab" or initial understanding or interpretation that the interpreter must necessarily make due to a lack of sufficient context or dialogue. This "first stab" understanding or prejudice will, however, become negative if the interpreter do not continually open himself to the potentiality of new understanding that may emerge.

There are methods for hunting. More specifically there are methods for tracking down prey. Although there could be many methods (ways) there can only be one technique. Technique is that one method that is absolutely efficient. Thus, when the claim is made that a specific method is the technique for tracking, then the claim is, in fact, that the specific method is the absolute efficient method of tracking prey. Thus, technique is the absolute efficient way of achieving the end. For any one situation or end there can be one, and only one, technique. In this sense technique is always an ideal. It is the continual striving for, or reaching for that one absolutely efficient method. Jacques Elull [7] defines technique as follows:

> Technique is the totality of methods rationally arrived at and having absolute efficiency (for a give stage of development) in every field of human activity.

There are two aspects of technique that need further interpretation. First, technique is based on technical rationality. Technique is a designed or rationally constructed method. Reason is applied. Based on the efficiency criteria numerous methods are designed (innovated) and evaluated rationally, to produce the most efficient. The efficiency criteria automatically separate less efficient methods from the techniques.

Second, technique is "end-directed" or teleological. Techniques produce ends. They are designed to produce ends. However, only technique followed meticulously, will produce ends. For the reward of "absolute" efficiency, the applier of the technique must sacrifice the choice to deviate from or alter the method. In that sense technique is always monopolistic or totalitarian.

Information Technology as Technique

Information technology is the manifestation of technique. As technique it processes all the elements of technique. It is consciously and rationally constructed to produce defined outcomes (ends). It is made not constituted. In the organization it integrates man into a larger technique (machine); the modern organization. Man conforms to the system. As processing technology information technology is creating a standardized world. There are standardized user interfaces. All over the world the way money is withdrawn, transferred and deposited by an automatic banking machine is the same. Text processing is standardized; we "insert", "delete", "move" and "indent" text in many diverse cultures and countries in the world. In this standardized world man finds it increasingly difficult to express himself in a unique and revealing way. Even the ASCII character on the screen, disk or paper 'depersonalises' the very act of writing. The individual imprint of handwriting and editing is replaced by a standard set of characters that is 'evanescent, instantly transformable, in short, immaterial' [18].

The push for absolute efficiency has made every domain in the organization a potential area for the application of information technology. There is no doubt that information technology can achieve levels of efficiency that is beyond the reach of physical man. Today, information technology is seen as the major source of competitive advantage [16]. In the competitive economic reality information technology has become inevitable and autonomous, as is clear from the following remarks;

> ..that the potential benefits which flow from this new technology [Information technology] are so enormous that there will be no question of avoiding or slowing down their actualization. (King in [20, p.79])
>
> The stark choice for British industry is to automate of liquidate. [2]

With information technology the one-dimensionality of technique is embedded into the very fibre of the organization. Information systems are designed to achieve explicit goals and objectives not implicit goals. Systems are constructed to solve definable, expressible problems; problems of a technical nature; problems that can be expressed as technique. Information technology (in its actual manifestation in industry) optimizes in terms of the technical, sometimes but seldom in terms of the social, almost never in terms of the individual person.

Furthermore understanding is substituted for technique. How often one hears "I don't know why, that is the way the computer does it". Managers 'alienated' from the day-to-day actuality find it difficult to determine the significance of the data in the reports. They have lost the context from which these data elements have emerged. The knowledge of the business processes is dispersed between the system designers, users, mangers and the code. The wisdom of the whole [3] is substituted for the efficient solution of the part. However, the most important aspect of information technology as communication technology and as technique is the erosion of the social and existential space of man; the creation of an electronic society in which it is becoming less and less possible for man to exist as unique being.

Information systems as functional entities and information technology as technique has created a mechanistic worldview that have disregarded a major dimension of information systems. Information systems have been reduced to a box of tools applied simplistically in a mechanistic world to the detriment of man and the totality of his person. How does this view manifest itself in the organization today?

4 Information System Ideologies

If one maps the functional and technical view of information systems on a social world, what emerges? The duality of technique and social perspectives bring with it a whole set of ideologies, the following which will be briefly discussed:

- Information Systems as Language Games
- Information Systems as Panopticon
- Information Systems as Taylorism

Information Systems as Language Games

Mumby [15] has shown that language is an important structural component of social systems. Language is an impor-

tant vehicle of power. In its content and usage. By using a language we can frame, articulate and communicate our thoughts. By communicating our thoughts we can influence and intervene in the social reality around us. Thus, to communicate is to assert power (ability to influence). By denying a language we are limiting the users of that language the ability to influence, and thus to assert power.

From the above perspective it is clear that one can assert power by changing the lexicon being used to a set that is familiar to you but not the other person(s). This form of power is often used by information specialists. The user is confronted with entities, relationships, data flow, decompositions, normalization, algorithms, decision tables, and various other forms of technobabble. The user is placed in a world where he cannot frame and articulate his thoughts. In this way the user loses his ability to influence and is viewed as "illiterate". The information systems specialist proceeds to define his world for him in his own technical language. This is why Boland observed that ". . . designing an information system is a moral problem because it puts one party, the system designer, in the position of imposing an order on the world of another [the user]" [4].

The design process becomes a language game, a power game, where the information specialist imposes a world-view and order on the user. The user is at the mercy of the designer. It is the designer who decides what is, or what is not possible (in this world defined by him and imposed on the user).

There is another dimension in the language game. The designer also has the ability to provide access and deny access to the texts (reports, queries etc.) created by the computerised information systems. He also has the ability to influence what data is captured, how it is captured, how it is stored, and even what it will be known as. In this way he cannot only define the design language but also the eventual systems language. It is clear therefore that the information systems specialist is in a very powerful position to manipulate the eventual organizational language or lexicon. These language games add to the technical problem a moral problem, one that most information specialists are completely unaware of.

It is clear that information systems design is not merely an objective, apolitical and rational process. It is a complex socio-political intervention. This is why Lyytinen [14] sees the information systems development process as ". . . an instrument in organisational change. . . "

Information Systems as Panopticon

Information systems have become for many the twentieth century's panopticon [9]; a technique or instrument of power. The panopticon was designed by Bentham as a technique to rehabilitate prisoners. With the panoptican the prisoner can be watched without him being aware when and what is being watched. At every moment every action could be monitored and recorded. The ever present eye (universal transparency) produces the effect that the prisoner eventually conforms to the behaviour expected as every action has the potential of being watched and recorded.

Many performance tracking and monitoring systems today are no more than modern day panopticons. For the pure technician the monitoring of people is nothing different to the monitoring of machines. As Zuboff [22] argues:

> Information systems that translate, record, and display human behaviour can provide the computer age version of universal transparency with a degree of illumination that would have exceeded even Benthams's most outlandish fantasies. Information systems can automatically and continuously record almost anything their designers want to capture, regardless of the specific intentions brought to the design process or the motives that guide data interpretation and utilization.

When you monitor people then the interpretation and utilization of the data captured become a social and moral question and not a purely technical one. It creates a power relation that can be used and abused. Some may argue that the use of the tool is not the concern of the designer. Can the designer simply distance himself from the consequences of his technology?

Not only in the performance monitoring systems are universal transparency created but also in the emergence of large corporate databases. With the explosion of data in large databases a new 'self' is constituted; a 'self' represented by the records in these databases. A 'self' that can be acted upon to the detriment of the "real" self without that "real" self ever being aware of what is happening [18]. A new form of power is emerging. Information systems as panopticons are creating power tools that demand moral scrutiny. Information specialists must also act as moral agents in an increasingly transparent world.

Information Systems as Taylorism

In the 1890's F W Taylor defined a set of principles called "scientific management". Scientific management was a set of principles governing the design of jobs. It advocated the following:

1. the fragmentation of work into simple, routine operations.
2. the standardization of each operation to eliminate idle times.
3. the separation of conception from execution - the design and control of work being a management task.

Information technology from the start was a form of neo-Taylorism. Transaction processing systems that form the base of most modern organizations information systems are based on the principles above. Find the transactions, document them, analyze them, optimise them, and then finally automate them. Today business process redesign projects often entail redesigning individual jobs, in some cases leading towards de-skilling of job content [21]. In the modern CAD/CAM factories artisans merely monitor the computer. The modern physician is becoming more and more a technician only reacting to his instruments. We have surrounded man with technology to the point where he has become a technological 'self'; deskilled and relegated to a machine monitoring a machine; the product of technique.

5 Conclusions

Now one can construe that the only option left is to rid man of information systems and technology. This will not be possible and may even not be completely desirable, for there are certain facts that cannot be denied:

1. Technology cannot be "uninvented". This implies that it is impossible to turn back the clock.
2. Efficiency (and effectiveness) will stay a base norm for success in the business world.
3. Many, if not most people, educated by the mass media do not appreciate the moral dilemmas technology brings and would continue to embrace it.

What we need to do is remember the following propositions about technology in general as postulated by Elull [8]:

- First, all technical progress has its price. Do we understand the price?
- Second, at each stage it raises more and greater problems than it solves. Do we know what new problems are being raised?
- Third, its harmful effects are inseparable from its beneficial effects. Are the harmful effects at all avoidable?
- Fourth, it has a great number of unforeseen effects. What are the unforeseen effects?

We need to develop information specialists who take a more holistic view of information systems and technology. Who understands that information technology is a technical, a social and a moral problem. Without this approach we as information specialists will lose all credibility and as pure technicians become the dinosaurs of the future business community.

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The prime purpose of the journal is to publish original research papers in the fields of Computer Science and Information Systems, as well as shorter technical research papers. However, non-refereed review and exploratory articles of interest to the journal's readers will be considered for publication under sections marked as Communications or Viewpoints. While English is the preferred language of the journal, papers in Afrikaans will also be accepted. Typed manuscripts for review should be submitted in triplicate to the editor.

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Manuscripts for *review* should be prepared according to the following guidelines.

- Use wide margins and $1\frac{1}{2}$ or double spacing.
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  - title (as brief as possible);
  - author's initials and surname;
  - author's affiliation and address;
  - an abstract of less than 200 words;
  - an appropriate keyword list;
  - a list of relevant Computing Review Categories.
- Tables and figures should be numbered and titled. Figures should be submitted as original line drawings/printouts, and not photocopies.
- References should be listed at the end of the text in alphabetic order of the (first) author's surname, and should be cited in the text in square brackets [1–3]. References should take the form shown at the end of these notes.

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