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**IMAGES OF INFORMATION SYSTEMS
IN THE EARLY 21ST CENTURY**

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PROFESSIONAL

IMAGES OF INFORMATION SYSTEMS IN THE EARLY 21ST CENTURY¹

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ABSTRACT

As we enter the 21st Century, we are confronted by waves of new technology and pressured by competitive forces to find the most effective and efficient uses of information systems (IS) in organizations. Periodically, it is useful to stand back and take a look at the IS field from a variety of perspectives. These perspectives create “images” of IS that offer the potential of generating new insights into the field as it moves forward. These “images” are created through the lens of metaphors. Metaphors have been used in IS to help explain many of its central concepts from systems development methodologies to human-computer interaction. This paper describes five metaphors for the field of IS itself. From these metaphors a set of challenges for IS researchers and practitioners is proposed.

Keywords: information system metaphors

¹ Editor's Note: This article is an expanded version of the keynote address presented at the 1999 Australasian Conference on Information Systems, December 1-3, 1999 in Wellington, New Zealand.

I. INTRODUCTION

As we enter the 21st Century, the field of Information Systems (IS) continues to undergo significant change. We are confronted by waves of new technology and pressured by competitive forces to find ideas that will help generate the most effective and efficient uses of information systems in organizations throughout the world. Over the years, the opportunity to visit New Zealand and many other places around the globe provided me with some ideas on the evolution of information technologies and the field of information systems (IS). It is these ideas that I would like to share with you. It is my view that as a field of knowledge, information systems has the potential to be the preeminent knowledge generator in business and management in the early 21st century.

I have been a practitioner, student and observer of the field of Information Systems for over thirty years. I saw it evolve from its reference disciplines such as accounting, management science, and computer science to the important and independent status that it holds today. As we enter the new millenium, it is appropriate to stand back, and with “fresh eyes” look at the field of IS -- where it is now and where it is going.

I will proceed as follows. First, I present a brief overview of the field of IS as context for my talk. Next, I propose the idea that metaphors provide the “fresh eyes” to create new “images” of IS. I then describe five of my favourite metaphors for looking at the field of IS and sum up by talking about some of the challenges to the field that arise from the insights provided by these metaphors.

II. THE FIELD OF INFORMATION SYSTEMS

When I talk about the field of Information Systems, I am referring to both the scholarly or research-oriented side of the field as well as the practitioner side. However, even though my remarks relate mainly to the research-oriented side of the field, I hope that some of the ideas appeal to the practitioner side as well.

Computers first started appearing in organizations in the middle 1950's. It was not until the late 1960's that a number of IS pioneers in North America,

Europe and elsewhere decided that enough was known -- and not known -- about the use of computer-based information systems in organizations, that the academic study of these systems was a worthy pursuit. We are a young field but a field that in the past thirty years achieved substantial growth in not only the numbers of scholars investigating phenomena in the field, but also in the number of journals publishing IS research, and in the number of other disciplines citing IS work.

I see the field of IS as essentially the study and the practice of the design, development, use and management of computer-based information systems in organizations. It is the research and application of “things” (both abstract and concrete) and “processes” (that happen over time). The “things” include information, its types and uses, as well as technologies and systems (hardware and software). The “processes” can be divided into two broad areas: design and development of systems, and the support (which includes management processes) and training processes necessary to use those systems effectively.

III. METAPHORS AND INFORMATION SYSTEMS

Even though we have come a long way as an academic discipline in a relatively short period of time, compared to most disciplines we are still in our infancy, or at most our early adolescence. It seems that this might be an opportune time for reflection on the field of IS, and that taking a look at the field from a number of perspectives might provide insights that might not otherwise be available. I found it useful over my career to use metaphors as a means of examining phenomena from “different angles”. Some of these metaphors did not work and quickly fell apart. But others did seem to work and provided new ideas for the phenomena that were being investigated.

For example, one metaphor that I use effectively in teaching information systems to undergraduates, graduates and executives is a metaphor that looks at “information as an organization drug”. The idea is that information is a “drug” to “improve the health” or “enhance the performance” of the organization. The notion is that information in an organization can have both positive and negative

impacts, as can physical drugs. Just as drugs for the body can cause side effects, information can also cause “side effects” for organizations. Just as drugs can have interaction effects with one another if taken together, so can information result in expected and unexpected interaction effects in organizations. We have information “users” in our organizations. Users can become “addicted” to the information they need. We have information delivery and monitoring systems, as well as regulating authorities for information. The metaphor breaks down, as do all metaphors (or they wouldn’t be metaphors!) the deeper one goes into the comparison with the actual phenomenon. But the value of the exercise comes in “seeing” and thinking about familiar things in new ways. That is what I hope to do. I would like to frame this talk by using metaphors to provide insights, not into specific concepts in the field such as information, but into the field of IS itself – where it is and where it is going. My thanks to Gareth Morgan (1997) whose book “Images of Organizations” provided a number of insights of their own for this talk.

I believe I have actually been developing this talk for the last thirty years! I have been fascinated for a long time with how people use metaphors to explain things in their lives. I have been particularly struck by how information systems people use metaphors when describing complex concepts to users or describing processes and new ideas among themselves. Indeed, IS writers and researchers have used metaphors for a long time. For the most part, metaphors help explain many of the concepts that are central to the field of IS. Examples include the “battle” metaphor to explain IS strategy development, or the “folders and files” metaphor to explain database structures, or the “family” metaphor to explain socio-technical design. When you analyze the writing and speech of people in the information systems field you quickly realize how much metaphor is used.

Over the years, and particularly in this last year, I examined much of the IS literature published in the major journals searching for metaphors. I also talked to many IS people including researchers, practitioners, and users, about the metaphors they used and which ones seemed to be their favourites. I was

surprised by how passionate some people were about their favourite metaphors and how loyal they were to them. I know you have your own IS-related metaphors. Here are mine for the field of Information Systems.

METAPHOR ONE: THE INFORMATION SYSTEMS GAME

One can look at the field of Information Systems as a “game”. The game metaphor is one of the most popular metaphors describing human endeavor today. A game can be a cooperative game where players collaborate with one another to achieve some objective. A game can also be competitive where teams of players try to prevail. A common theme of all games is that players engage in activities to achieve some goal or objective.

The game of IS has been played for many years and looks as if it will be played for many more. The object of this game is to gain the widest acceptance of one’s ideas. But to some, the playing of this game seems like the game played in Bill Watterson’s cartoon strip of a few years ago, “Calvin and Hobbs”. Calvin and his imaginary tiger Hobbs play “Calvin Ball” where the rules of the game are made up as the game progresses. This seemingly “chaotic evolution of the rules” makes for an interesting but quite unpredictable game. It also points out that some games such as IS need to support the “creative” side of play as well as the “structured” side.

Over the years, the “game” of Information Systems involved many “players”. Some were “stars” that influenced the game with the power of their ideas. Some were role players whose contributions are important but their significance is limited. In this game of Information Systems, it seems to me that we have had relatively few coaches who made a major impact. At this point, I don’t see this game as having “competing teams” as in a basketball or football game, but that may change in the future as competing IS frameworks and/or research approaches battle against one another for dominance.

The game of Information Systems provides some lessons for researchers and practitioners. First, I believe the game is a “cooperative-competitive” one. If the field is to progress, the players must continue to support one another to

create and develop the most powerful ideas they can but these ideas will have to compete with other ideas for acceptance. IS stars will need to be nurtured and challenged to reach their full potential. Role players and players whose contributions are of a supporting nature will continue to be important and should also be valued and supported. More skilled coaches are needed for players in this game. These coaches can pass on the lessons from when they played the game and the game and its outcomes will get better. Finally, instead of a “Calvin Ball” approach to the game, it seems to me the game of Information Systems will need to establish and communicate its rules better, and evolve them over time as the game and the “forces” around the game change, like a number of games (such as football) have done over the years. I believe the game should remain a cooperative-competitive game that enables as many players as possible to “win”.

METAPHOR 2: THE INFORMATION SYSTEMS ORCHESTRA

A metaphor that always appealed to me as a way to represent organizations is the orchestra. I think it is also a useful metaphor in describing fields of study such as IS. The orchestra metaphor has been used in many writings but probably the best known is Peter Drucker’s article on the “Coming of the New Organization” (Drucker, 1988). In that article, he described what he thought future organizations would look like.

An orchestra’s main purpose for being is to produce beautiful music. It does so by taking musicians skilled in the use of their individual instruments and getting them to play to a musical score under the direction of an experienced conductor. If the score is understandable and playable, if the musicians are skilled enough, and if the conductor is able to bring the diverse elements of the orchestra together to contribute their parts at the appropriate time, then beautiful music can be made. This scenario assumes of course that the composer wrote a musical score that is pleasing to the ear.

In IS, researchers are the musicians. These musicians are trained on a variety of instruments (their research methods), but typically specialize in only one or two instruments. These musicians group together around like instruments

(such as the violins or the cellos) and combine their efforts to push the music forward. Typically, there are lead musicians for their instruments like the first oboe or first trumpet. These musicians usually take the lead in coordinating and directing the other musicians in their group. Similarly in IS. Leading researchers (musicians) establish the standards and direction in their area. The objective of the IS orchestra is to produce beautiful music or high quality research for our audience. Our audience has a big impact on the music we play by expressing its appreciation (or lack of appreciation) for what we produce. From the listener's point-of-view (i.e., IS users, managers, researchers in other fields) this music should be coordinated and synchronized so that it is easy to listen to and contributes to their pleasure (that is easy to understand and contributes to our knowledge). This coordination requires a musical score (or IS research frameworks) and an experienced conductor to lead the field.

The strengths of this metaphor appear to be three-fold:

1. The notion that IS researchers need a "score" is a powerful idea that seems to be losing its importance in the field of IS. The use of integrating frameworks for IS research seems to be on the decline. This is not to say that all IS researchers should slavishly follow a single research framework but that more coordination in conducting and disseminating our research efforts might help our "audience" appreciate our work more.

2. An appreciation that most IS researchers are "specialists" in their own areas is important because it emphasizes that we can not be experts in all areas of IS and that concentrating our skills in particular areas may add strength to the over-all field of IS.

3. Recognition of the importance of the "audience" as a major determinant in the success of the field. It is my view that IS has tended to look inward in the past and not concentrate on what it is able to deliver to its practitioners and researchers in other fields. It is not that the audience dictates what is to be played because that is not usually the case but what our audience appreciates does get back to the conductor and musicians in the orchestra and does influence the choice of music played.

One weakness of this metaphor is that it implies the field of IS needs a “conductor” to coordinate all activities. This notion doesn’t seem to apply to a dynamic field such as IS. It may have applied in the early days of the field in the late 60’s or 70’s but it doesn’t seem like there are any conductors leading IS today. The field of IS has no such roles unless one sees the senior editors of the field’s leading journals as conductors. Another weakness of this metaphor might be that groups of IS researchers in one area can’t “play” with researchers in another area. It seems to me that one of the strengths of IS research is that even though we may be specialists in a particular area of IS research, we can still contribute to other areas.

METAPHOR 3: THE INFORMATION SYSTEMS MACHINE

The machine metaphor has been applied to many social phenomena in our world. Although it seems to be losing some favour, it still seems to be a popular metaphor because it captures a certain rigor or discipline in the underlying human situations to which it is compared. This metaphor is applied to general organizations, to the systems development process, and to knowledge management to name just a few.

The fundamentals of the machine metaphor are that the machine (a production machine, a car, a sewing machine) has a purpose or goal that functions in a pre-determined and predictable way. The performance of the machine can be gauged and adjusted to achieve peak productivity. The machine is designed and built in a rational way with all parts of the machine working together to produce some output. The parts of the machine can be replaced when they wear out or no longer function properly, and the machine will function as before. Of course, the parts need to be “well lubricated” to work together properly.

The field of IS can be thought of as a machine. The field has a defined purpose and goal (to produce and disseminate high quality research). We are all parts or “cogs” in the IS machine. This machine can be thought of as working in a pre-defined and predictable way in the sense that as parts in the machine,

we engage in processes such as conducting research, writing and reviewing papers that are defined and structured. This machine's performance can be measured in terms of the number of high quality papers produced and the number of new journals established. As parts in this machine, we must work together to keep the machine functioning properly or it will fall into disrepair (I am not suggesting we all be well lubricated to do this!). The idea is that if we all do what we have been "built to do", the IS machine will function at its peak performance level.

The IS machine metaphor appeals in that it projects an image of a well-functioning unit producing something useful. The attraction of the notion that if we just put the right parts together in the right way, we will create an IS machine that is not only efficient (producing more output per unit input) but also more effective (doing what it is supposed to be doing). By invoking the IS machine metaphor we subscribe to the notion that by working together we will be more effective.

The downside to the IS machine metaphor is that it is too rational. It assumes a simplistic and mechanistic view of the field where objective criteria rule and individual personality has no effect. It seems to me that where human endeavour takes place, rational thought and decision making are only part of the process. Another downside of the metaphor is the idea that individual parts (us!) are not seen to be as important as the functioning of the whole. This view creates problems on a personal level in the sense that human researchers are not easily replaceable and that individuals are important – or more important -- than the whole.

METAPHOR 4: THE INFORMATION SYSTEMS GARDEN

The garden metaphor appeals to me as a way to describe any field of knowledge. Even the term, "field," conjures up ideas of growth and renewal. This metaphor stands in stark contrast to the previous IS machine metaphor.

A garden is a place where things grow (and ultimately die). A garden is a place where, if the conditions are right and if properly tended and cared for, plants will grow every year. Gardens are tended by gardeners. The skill of the

gardener affects the development of plants in the garden. The garden usually has a structure, a plan, but within that plan there is usually some randomness and disorder (at least in my garden!). Growth depends on many factors, some controllable by the gardener and others not controllable (such as the weather). The garden, in a sense, adapts to the conditions it encounters.

The field of IS is a garden. This garden grows ideas that influence the world around it. The IS garden needs the proper conditions of soil, sun, rain and fertilizer to grow those ideas. Without the proper conditions, ideas may stunt growth or even wither and die. IS researchers and practitioners are the gardeners. We engage in activities that will give our plants (ideas) the best chance of growing. We use tools to perform our gardening activities such as our research tools and methodologies. The gardener chooses what to grow and care for, and the same is true for IS gardeners. At various times, our “plants” need more care than at other times but always there are the notions of creation, growth and renewal.

I like the garden metaphor because it reflects the life cycle idea. It implies that the field of IS is part of this life cycle. Ideas in IS do appear to go through life cycle stages of birth, growth, maturity, and eventual renewal or demise. I believe we can all think of IS ideas that went through this cycle. I also like the thought that even though an idea appears to be great, if the conditions in the garden are not right, the idea will not flourish. This notion of the importance of variable internal and external factors and their impact is again in contrast to the IS machine metaphor.

This idea of the importance of external factors also applies to the IS garden as a whole. The entire garden could wither and die if external factors drastically change, or the value of the garden itself is no longer appreciated. These factors can be mitigated somewhat by the resourcefulness and adaptability of the gardeners but it is clear that the IS garden is subject to variable outside forces as well.

METAPHOR 5: THE INFORMATION SYSTEMS JOURNEY

The last metaphor that I believe holds promise for the field of IS is the journey metaphor. This metaphor views the field as a process as opposed to a “thing” or “set of things”(such as machines, gardens, etc). As the field of IS enters the 21st Century, we can be thought of continuing a journey into new territory.

We have all taken journeys. A journey usually entails a map or a plan for how to get from where you are to where you want to go. But a journey also includes an element of chance or unpredictability that something unanticipated will occur on the trip. This randomness provides a sense of excitement for the travelers in dealing with the unknown or the unexpected. A journey usually involves people travelling together. All these people have roles. Some may be guides or crew that work together on the vehicle or vessel as it proceeds on its journey. They are trained to deal with most contingencies. Others are the passengers who trust in the crew to get them to where they are going. But the experienced passenger knows that any journey can be buffeted by ill winds and that external forces can always upset the journey.

I see the field of IS as a vessel or vehicle in which we are traveling into the 21st Century. This journey involves a general direction but no specific destination point. It is a journey where we are all at various times, crew and passengers alike. Sometimes we actively support the journey by working together to move us forward. At other times, we are passengers observing the world from our IS perspective as we travel through it, gaining new knowledge from that outside world. A number of unpredictable events occurred on this journey up to this point, and I think it is fair to say that as we travel into the 21st Century we will face many more challenges as we move along. As passengers and crew on this journey, how we react to these challenges will determine how smooth the trip will be and how fast we will proceed.

The journey metaphor is “time-based”. It recognizes that the field of IS is moving and that it is being “buffeted” by outside forces that affect which way it goes. These “forces”, such as the ascendancy of the PC and end user computing

in the 80's, or the explosion of the Internet and E-Commerce in the 90's, can be quite strong in IS. Some prominent IS thinkers argue that IS is "tossed around" too much by these winds of change and that we should make the vessel "more sturdy" for the path ahead.

But similar to other metaphors such as the orchestra, the journey metaphor implies a leader to lead the journey. This focus on a single leader again does not seem to be the case in the field of IS. The lack of destination is also problematic for this metaphor. On the other hand, an exciting but never ending journey might be an appropriate way of looking at the IS Journey.

IV. CHALLENGES FOR INFORMATION SYSTEMS

I described five of my favourite metaphors for the field of information systems. We can all interpret these metaphors in our own ways, but I believe all of the metaphors provide insights into major challenges that face the field of IS. From the "game" metaphor a challenge is to see IS as a cooperative game of constructive competition. Lack of cooperation or collaboration and destructive competition within the field will weaken it. We can already see some of the factions that have formed with the IS field (e.g. technical versus organizational researchers, quantitative versus qualitative researchers). The game metaphor also challenges the IS field to focus more on the need for top quality coaches to pass along the skills and experiences to new members of the team. We don't seem to recognize these coaches for the valuable contributions they provide. We seem to lose many of our experienced coaches to other activities, such as administrative duties, that may be damaging the field.

The orchestra metaphor is helpful to me in seeing the field of IS as a group of skilled specialists. The challenge for IS is to maintain and enhance the skill levels of our "musicians." In addition, we should identify the "instruments" (i.e. research tools and methodologies) that we lack, or are weak in, and renew our efforts to develop them. A second challenge is to appreciate the prominent role of the audience in determining the course of IS research. In IS research, as in IS practice, we forget the audience at our peril. Our audience isn't just fellow IS

researchers or IS personnel but it includes other researchers outside our field and users of our information systems. We are an applied field. The challenge is to keep the audience at the forefront of our thinking and be able to see our work through their eyes. The third challenge from the orchestra metaphor is to continue to create and evolve frameworks that will guide the field. It seems to me that these “scores” have received less favour in the last few years. But it is these frameworks that will help sharpen and focus our research. An interesting question is whether the field of IS will evolve more like an orchestra or as a jazz ensemble!

The machine metaphor is of intrinsic value to many IS people. After all, central to our field is the computing machine! The machine metaphor seems to appeal to our sense of the logical – the rational. Things work well when the right parts are in the right place doing the right thing. But this almost never happens in “human machines”. The challenge for IS is to balance the needs of the IS machine for efficiency with the needs of the individual. The question here is: Should we strive for a field of IS that is more machine-like, or will that remove too much of the individuality that sparks creativity?

The garden metaphor challenges us to look at the field of IS as something that goes through identifiable life cycle stages. These stages are greatly affected by external forces. This turbulence is very true of IS as it enters the 21st century. What new information technologies will evolve that will change the nature of work? Which major ideas in our field are at what stage in their life cycle? Indeed, at what stage do we see the field of IS?

Finally, consider the journey metaphor. It seems to me that all human experience is a journey. As the field of IS proceeds through time, it will be faced with new challenges and opportunities. These may be generated from within or they may be created from the outside. Whatever the case may be, the ultimate destination for the journey has not been determined and that is what makes it exciting. Some doomsayers argue that IS will cease to be relevant in the next 25 years as other developments and other fields overtake it. My sense is however, that IS will continue to contribute solutions to the challenges that face

organizations and society and that this journey will continue for a long time to come.

V. CONCLUSION

I hope I have given you some food for thought (another metaphor!). As you see, the invoking of metaphors surfaces some of the beliefs and values of the person describing the metaphor. I believe that this is one of the main benefits of metaphors. Not only does it help in describing something but it also indicates other underlying thought processes. This is true not only for the person describing the metaphor, but it is also true for the person listening to the metaphor! I hope these metaphors provide you with different perspectives of IS. I invite you to extend these metaphors when thinking about the future of the IS field. I also invite you to extend your use of metaphors to your own work and to other aspects of IS such as systems development (see Kendall and Kendall, 1993), knowledge management, and e-commerce.

I leave you with the words of Aristotle who wrote, “midway between the unintelligible and the common place, it is the metaphor which most produces knowledge.”

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R. Brent Gallupe is Professor of Information Systems and Director of the Queen's Executive Decision Center at Queen's University, Kingston, Canada. He also holds an on-going Visiting Professor appointment at the University of Auckland, New Zealand. His current research interests are in knowledge management systems, computer support for groups and teams, and global information management. He has served on a number of editorial boards including the *MIS Quarterly* and currently serves on the board of the new electronic journal, *Communications of AIS*. His work has been published in such journals as *Management Science*, *MIS Quarterly*, *Information Systems Research*, *Academy of Management Journal*, *Sloan Management Review*, *Journal of Applied Psychology*. He has been an executive in a number of IS practitioner organizations including the Canadian Information Processing Society. Gallupe holds a B. Math (Hons.) from the University of Waterloo, an M.B.A. from York University, and a Ph.D. from the University of Minnesota.

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