



# BETTER MEETINGS IN 2020

AMI Consortium  
and the Rezonance Network

Martigny  
February 4-5, 2008

## **CREDITS**

This white paper is provided to the participants of the Rezonance Network February 4-5 2008 meeting and the members of the Community of Interest by the AMI Consortium as part of an ongoing initiative to increase global study and understanding of the human-to-human communications and the future of technology-assisted meetings using automation and intelligent agents in an environment of virtually unlimited processing and bandwidth resources.

This white paper is designed to provide accurate and authoritative information in regard of the future of meetings. It is made available by the AMI Consortium, with the permission of ParkWood Advisors LLC, with the understanding that the intent is not to render legal, investment, accounting or other professional advisory services.

If investment advice or other expert assistance is required, the services of a competent professional person should be sought. Requests for permission to reuse the contents of this document or for further information about its contents should be addressed to John Parkinson at ParkWood Advisors LLC.

## PREFACE

Speaking and digitally publishing about a subject are two very, very different things. In the case of predicting the future, however, the tangible results may be the same.

When speaking about meetings in 2020, a presenter has a lot of liberty because chances are relatively high that no one in the audience will remember what he or she said about the subject by 2020. And, in contrast with what you might expect, a digitally published/stored archive of the same concepts will probably also be “lost” for all intents and purposes. For John Parkinson, Chairman and Managing Partner of ParkWood Advisors LLC, the risk of his words fading and disappearing long before the accuracy of his predictions are tested just comes with the territory.

Parkinson introduced his talk, a keynote address at the Wainhouse Research European Forum 2006 in Berlin entitled “Meetings in 2020,” with a touching reminder that predictions of the future—even the future of technology over the past 50 years—have more frequently been wrong than right.

All predictions/forecasts and recommendations made in this paper are the rights and responsibilities of ParkWood Advisors LLC.

Only time will tell how well the words of 2006 will fit the future.

Christine Perey, AMI Consortium Technology Transfer

## THE FUTURE IS FUZZY

One of the hardest things for a futurist to do is to take people out of the familiar context of today, and yet, it is absolutely necessary to break free of the present if one is to catch a glimpse of the future.

Humans have a perception of change over time which is distorted—most interpret change as linear. Unfortunately, ten years in the future is about as different from today as twenty-five to thirty years in the past. And this departure from linearity is accelerating.

In order to understand how different the world will be in 2020, comparing today with an equal time in the past (14 years at the time of this writing) would be misleading. Rather, one needs to compare what is going on today with what was status quo in 1965. No cell phones. No personal or portable computers. No Internet. Much greater obstacles to travel. In order to get a glimpse of the future of meetings, we need to build scenarios on which we can project trends. But scenarios do not make predictions. They only provide a framework in which to position a few assumptions and to examine the consequences if the assumptions, in fact, are true.

There are several rational scenarios in which it will become either very expensive or relatively dangerous to travel to routine meetings. In one scenario energy is very expensive. The second scenario examines what could be if the first scenario wasn't true, if travel was easy and cheap but that concerns about global disease spread would reduce travel.

In both these scenarios people don't like to travel and people don't like to meet strangers. Instead, because meetings are necessary for operation of the world's economy, people develop alternatives to face-to-face meetings. The alternatives are extensions of the advancement of core technologies.

The purpose of the first section of this paper is to extrapolate some basic parameters into the future in order to form a foundation for the predictions. Next, we briefly look at how human activity and behavior will change in response to the core technological advances. Finally, we will focus on the behavior in meetings and types of meetings possible in 2020.

## WHAT IS SCIENCE DOING FOR US ?

A lot.

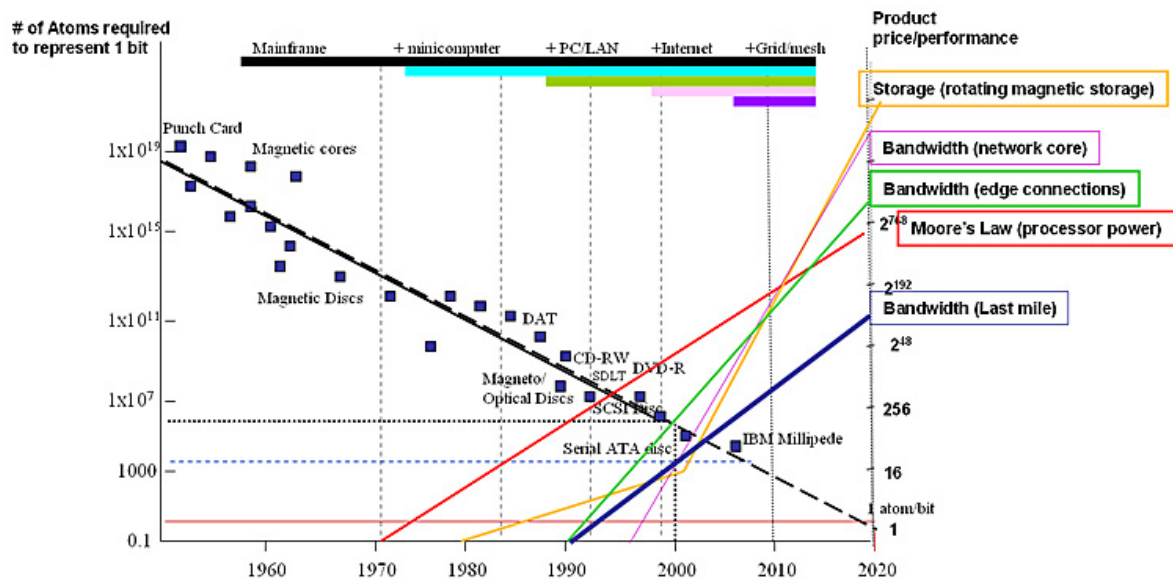


Figure 1. Atomic requirements for storing one bit of data.  
Source: IBM Research and ParkWood Advisors LLC

Figure 1 is based on research from IBM and expanded upon by ParkWood Advisors with newer technologies and the price performance lines for processor power, storage and connectivity. This shows that in 1950, punch cards could store 80 bytes of data and it has been improving ever since. Very clearly there's been a log linear correlation to improvement in storage density such that sometime around 2020, we will be able to store one bit for every atom. This is good news for the people who build storage, but for anyone else it is disastrous because if you look at the trend in data storage requirements, by 2020, we need more atoms than we have. In reality, the problem is even greater because to be secure you must keep at least one copy of all information. And even though compression will help the situation, to keep the calculation simple, it is fair to predict that most information will be duplicated.

By 2020, there will be so much digital information that there will begin to be doubts about how to store it, but in fact, that will be heavily influenced by the stability and reliability of software. The problem of error-proof software is far from being solved. However, many engineers are and will continue to work to address the challenge and the present analyses assume that software reliability will be common place.

The other resource which the scenarios assume is abundant is bandwidth. The global bandwidth consumption up to 2005 is depicted in Figure 2.

As long as these measurements have been used for predicting the future bandwidth requirements, there have been errors. Regardless of this poor track record, however, the scenarios and models on which this paper is based assume that in 2020 growth in data traffic will exceed growth in economic activity. It is, in effect, Metcalf's law essentially applied to macroeconomics. The more humans connect things together, the more they will need to connect things together, and information needs to travel faster than atoms. So, although economists expect robust global GDP in the next decade and a half, the rates of increase in information traffic as a consequence will be much greater. In 2020, peak packet loading and the core Internet will be reaching around ten zettabytes per second.

As a result of these core technologies improving, we have lots of bandwidth, lots of reliable software running on low cost processing sites and we're getting all these new capabilities as a result: For example, network-connected digital sensors are everywhere.

Sensors are capturing information and software is processing its contents, continuously. Surveillance is going to become ubiquitous over the next decade and a half so in 2020 all public spaces are continuously monitored for safety and security reasons, a lot of private spaces probably as well—work spaces? Certainly. Domestic spaces? a little harder to judge, but very probably, especially if you want insurance at a reasonable price.

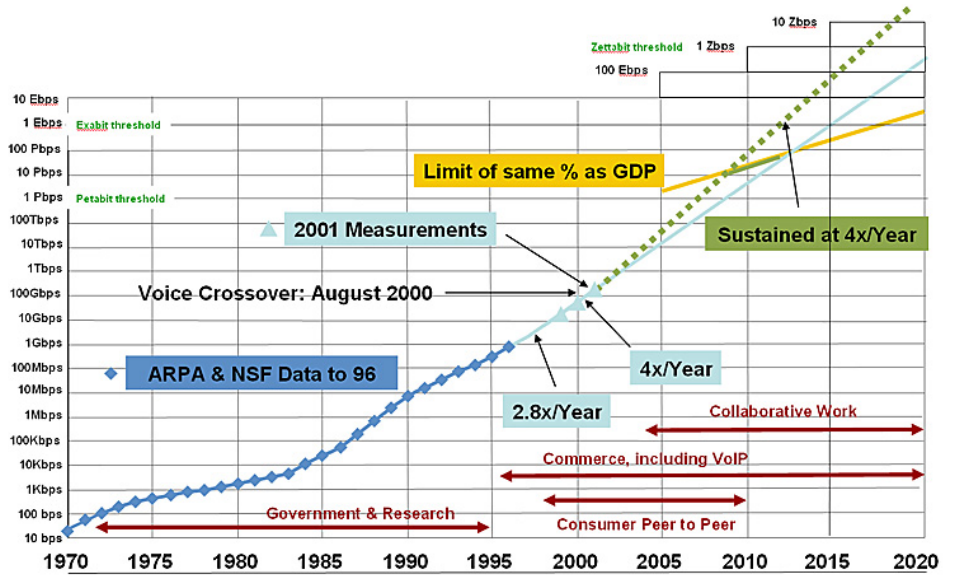


Figure 2. Global bandwidth consumption forecasts. Source: ParkWood Advisor LLC. Based on original graphic by Tewlegeography.inc, using sources such as ARPA and NSF up until 1996. Projections beyond 1996 by ParkWood based on IETF and ICANN estimates

## LEVARAGING AUTOMATION

Reliable software will be working overtime for us in 2020. Lightening the “weight” of information processing on the human, making more information processing digital, is one of the logical consequences of advances in core technologies which we have examined above.

Most people in 2020 receive so much information that they can’t process it. They don’t need (are not expected) to process it because software reads (or processes) the low priority

pieces and files them or discards them based on user-defined settings. This is an example of what a semi-autonomous agent can do for its user. Another example is responding to inquiries, such as a ringing telephone. How often does the phone ring in 2020 and the person’s agent answers? Frequently. As IP telephony progresses, a number is no longer tied to physical locality. Already today the most commonly asked question when speaking with someone by phone is “where are you?” but in

2020 the systems permit us to know more (and care about certain details less) in less time.

We have not been good predictors of how new technologies change human behavior, but we can hope that our ability to focus and collaborate will improve in the future. One of the results of increased automation in the environment surrounding people is that the average person will focus on other tasks than the mundane.

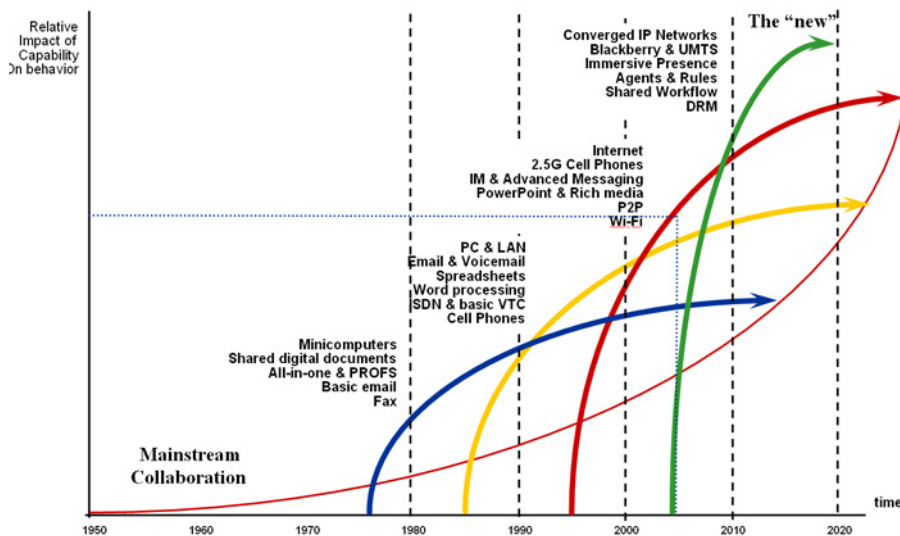


Figure 3: New Technologies change behavior in unpredictable ways

No one will remember phone numbers or addresses. The phone, or whatever the personal computation and communication device will be called in 2020, is an extension of the owner/user's memory. In fact, the reliance on digital processing over bio-processing—having the brain store the information and do the work—will be such that the very nature of what we do will be completely different.

So this brings up some new challenges and opportunities. First, if we have a completely monitored world we can take the media from surveillance capture devices and we can use algorithms to “see”—to interpret—what is happening in the present or what happened in the past. Let's take an easy example.

Imagine algorithms that detect whether a person is being ambiguous or lying on purpose, like a lie detector works today. Some justice systems already have this technology and it will probably be in use everywhere in law enforcement before the end of this decade. Variants of these systems will be used in business settings as well. As a result of algorithms detecting non-verbal human communications—something we do subjectively already, will be performed objectively, based on statistics and machine learning, in the future—a lot of explanations and misunderstandings can be avoided. This will be particularly valuable in cross-cultural settings. In meetings involving people who say “yes” when they mean “no” and the opposite, many meeting “assistants” will in effect translate the original intended meaning in the appropriate signals for the user.

The second thing we can do with an abundance of processing cycles is to automatically simulate different future scenarios. There will be servers

who will be dedicated to simulating everything that we are speaking about or thinking of doing in models. These servers will then compare the outcome of the models with what is actually going on and, by flagging discrepancies automatically, permit individuals, teams and companies to see whether the future is diverging from their expectations in fundamental ways.

Another manifestation of automatic, real-time processing is the emergence of virtual offices. The third fundamental transformation enabled by the surplus of processing and bandwidth is an improved geographical distribution of resources, human resources, in particular. Already today, as a result of corporate videoconferencing, people will be more likely to live where and how they want while maintaining or exceeding the levels of productivity they would have if sharing the same building or office. With High Definition videoconferencing this trend will become more and more attractive. Immersive environments, such as telepresence installations today, will be accessible to more people.

From the standpoint of risk management, distributing key resources geographically is a positive consequence of the emerging communications technologies. It also means that a company will have better access to local resources, filling needs, in real time, in local markets.

Automation will also reduce decision-making responsibilities of certain people on certain tasks. We can stop having to decide everything for ourselves. We can assign certain decisions to the software which is based on past preferences, as well as the forecasting abilities mentioned above.

## PAYING ATTENTION

One of the consequences of automation is that humans will be able to focus greater attention on things that cannot be delegated to software. Some view what we currently do in meetings as augmented attention. People sit in meetings, on conference calls, with IM windows open, doing e-mail, surfing the Internet and whatever else people choose to do when others can't see them and think they have the attention of others. More and more people realize that they are distributing their attention across many more diverse objects or conversations. Figure 4 shows what a future social network might appear when plotted.

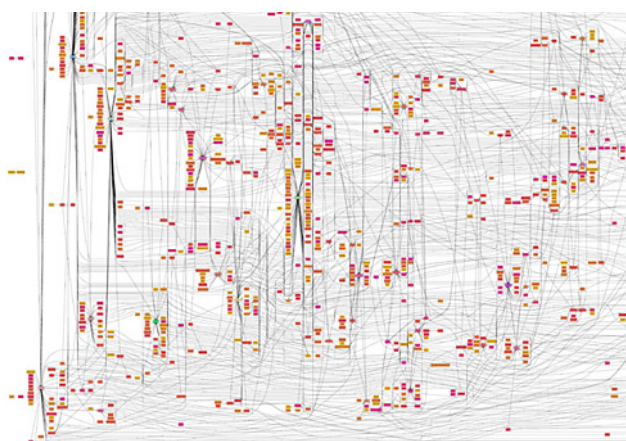


Figure 4. Social Networking Map in 2020

Youth in 2008 are already doing this as a part of their natural social existence. In the future, attention will be one of the most valuable human resources available and people with the skills to become the focus of attention, or to distribute attention very well will be recognized for their achievements.

Instead of paying two seconds of undivided human attention to determining which room is available for a meeting, a software application will designate a meeting place convenient for all those in the same building. For those who are participating in remote meetings—the majority of people in certain domains—the challenge will be designating or designing the best virtual meeting spaces.

## MEETING IN 2020

Given all of this background and these processing and bandwidth resources, what will meetings be like?

The first attribute which we can be relatively certain about is the physicality of people in a meeting. It would cost too much to get all the participants in a meeting together in the same place under the scenarios used for this analysis of the future. It would be too expensive in terms of fuel or it would be dangerous. So very, very few people will meet in person—in vivo—in 2020.

Most meetings will be conducted in virtual. The environments could still resemble one another, to reduce the distractions but the participants

A significant amount of attention could be given to the selection of virtual meeting “places.” Imagine a meeting place that would look exactly like a normal meeting room with tables and chairs, but everyone could feel as if they are sitting in the front row. In the acoustic domain, the audio level of a space could be made uniform so everybody can hear the speaker all the time. This is already possible in some high-end meeting facilities. Now let’s apply automation to this meeting and perhaps the participants can speak in their native language and hear others in any language they choose, making it easier to pay attention.

will also have the possibility of sending digital representations of themselves. A whole new set of rules around how to prepare for meetings and participate virtually in meetings will need to be developed.

Let’s examine the flexible parameters around future meeting “places.” Some meetings will be conducted on the dark side of the moon. All we need is the telemetry data to build the model. Some might want to meet on the death star from StarWars. All they need is George Lucas’s permission to use the intellectual property that the representation of that space requires. This raises some interesting issues of intellectual property. Who owns the representation of the Taj Mahal or the White House? If a model can be generated of an existing physical space, and if that model can be digitally represent and sold as a place to meet, then who owns it?

Similarly, when people will attend meetings in 2020 they might choose a persona different from their own. A persona can be constructed digitally that would represent a participant and behave as if they were that person. And one of the problems that arise from this advanced capability is being able to authenticate the people who join a meeting. This is not a matter of a user ID and password. How will people know who they are meeting with, their level of attention and their rights and responsibilities?

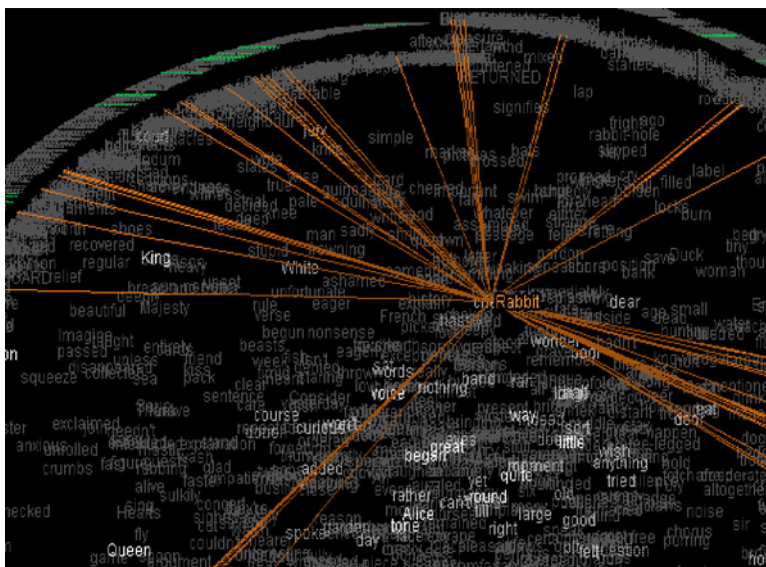


Figure 5. Lexical Analysis of Alice in Wonderland



People who appear to be participating in a meeting and paying attention, might in fact be listening to their digital music and doing IM and whatever else they do in meetings even though they will appear fully engaged. Conversely, if an agent is attending a meeting on behalf of a participant who is completely absent, how much should other people know about that person's background, past positions on issues and how far from the originally planned agenda can the meeting diverge? When a meeting participant assumes an action item, or influences a decision, who is responsible, the person or the company who provided the agent?

Another necessary precursor to a meeting in which important decisions will be made is to make sure the right people participate. Clearly, new authentication etiquette will need to be developed to clarify these grey areas of who is participating fully, partially via an avatar and who has only sent an agent. There will need to be some very strong out-of-band, key exchange protocols to have the encryption that is going to make these kinds of meetings possible.

After a meeting participants will be able to replay all or parts of a meeting, at least until the planet runs out of digital storage capacity. Everything that goes on in meetings will be subject to post-meeting analysis, post realtime meeting progress analysis, and a much closer scrutiny than we have today.

For example, there will be software to measure the conversation that is happening in the meeting. An example is the lexical analyzer in Figure 5. It is showing the relative strength of association between the keywords that are being used during the course of the meeting and then mapping these out in a hyperbolic tree that shows how far away from the decision words the people's words are.

Meetings in 2020 will not be low cost even though they will become virtual because they consume processing and bandwidth resources. In order to optimize resources in 2020 people will also do different things between meetings.

Meetings themselves will, especially with important people and on important topics, be prefaced by a great deal of preparation. Simulations, data gathering and organization, agenda management, profiling of the other participants, expected outcome analysis, interaction analysis models that will all be preloaded so that during the meeting, the participants are attentive but in the background there is software comparing what is happening during the meeting with the expectations. For example, participants will be able to compare their actual amount of time on a topic with their projected or model agenda.

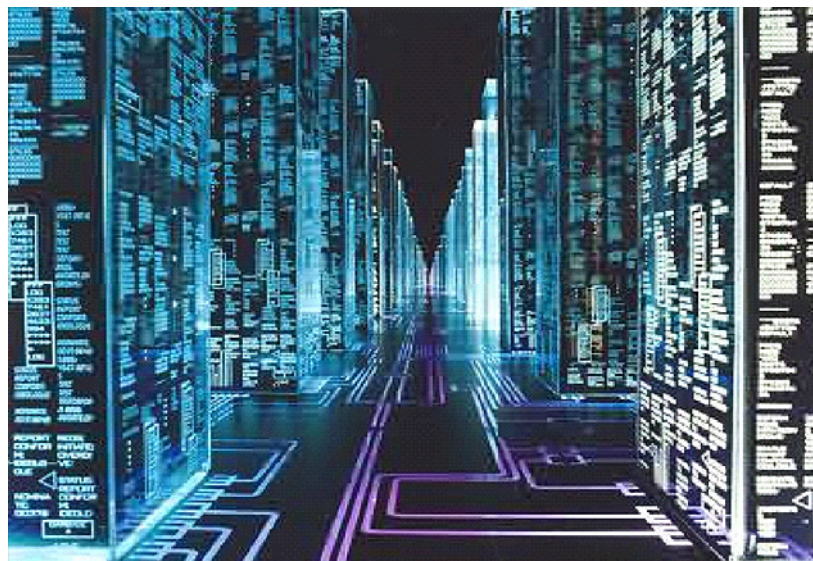


Figure 6. Visualizing information sets, decisions and outcomes

## MEETING PATTERNS

It's already pretty clear, with the behavioral analysis that has been done on meetings, that most people don't meet very effectively. Humans can concentrate on something for about twenty minutes and then whether they like it or not, their attention drops off. Even in life threatening situations, that is a pretty good generalization.

Meetings could be designed and managed to meet this human limitation. People may concentrate all their attention and work hard for a short period, then slow down and exit a meeting, then they might return to a higher state of attention and focus, then slow down; this behavior is sometimes called "sprint and glide" by psychologists. There are other names for this pattern in various meeting formats but regardless of the name, such entry and exit patterns will be more common place when people can also "catch up" with a meeting in progress. Being an intermittent meeting participant may not seem productive today, however, the 2020 some form of sprint and glide will be the norm.

One variation on this theme is that of having different meeting types. There are different interactions modalities that are associated with those different purposes and it's not clear if people are most productive when these are mixed in one meeting. It is not difficult to justify having one meeting to organize the "confirming" activities and separate out the "deciding" activities for another meeting.

This also aligns well the change in attention focus. In 2020 people will be more prone to getting interrupted because meeting assistants or agents are continuously introducing new information to individual participants in the background; what is the protocol for interrupting someone when they are in a virtual meeting via presence: does one replace use of an avatar? How do participants make it clear that

they aren't paying attention anymore? Then workplace psychologists will have to reinvent all of the rules and ritual of meetings because we aren't doing them the way that humans evolved to do them anymore. It's going to take a while to work these new rituals out and it will go far beyond what we can imagine today.

Here is an approach to representing complex data structural navigation problems. So if you're trying to figure out how to do a merger between two companies you want to know where the information environments, the social, and asset environments mesh together. How do you do that? That is an impossibly complex representation problem in data visualization today, but it won't be in 2020. We will have routine tools that we will have learned to interpret with the help of software to make that work.

Figure 7 is a model of how a meeting is supposed to go: it's a plot of what the sub-themes of the meeting are supposed to look like and a trace of how the timeline is moving through those themes: are you getting anything done? That is what it is there to detect. So we will have a lot of these tools and they'll all be around for everyone to use.

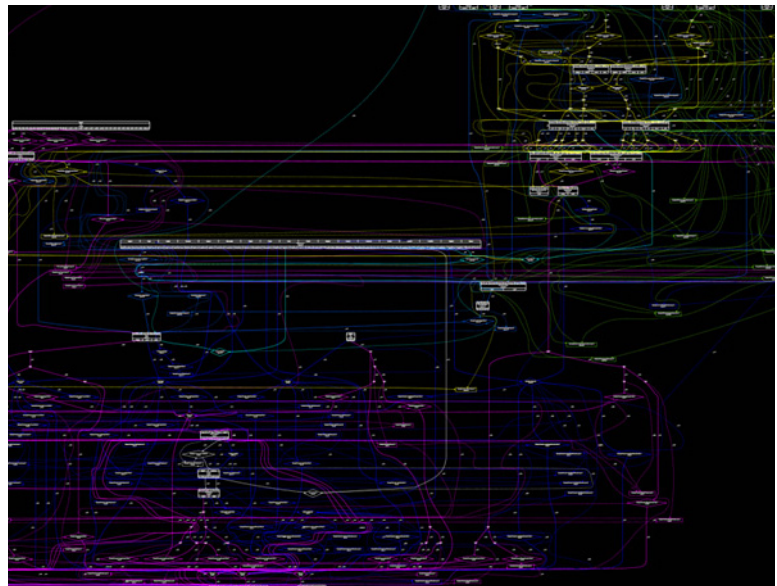


Figure 7. Managing Meeting Models, Time Lines and Interaction Effectiveness

## BEYOND 2020

Work on most of the challenges we have discussed so far began in the 20th century and is being stabilized and commercialized in the first two decades of this century. Looking out ahead, what will be the 21st century's biggest contribution to the human productivity? One area we have highlighted here and which will certainly merit a great deal of investment is attention management.

How do you make me able to function more than 24 hours a day, more than seven days

a week, more than 365 days a year? Humans still only have 24 hours a day no matter how many time zones they cross physically and virtually. If in the second half of this century we can make more tools that permit people to function at more than a one to one ratio with real time, human productivity will be measured in completely different metrics. These are the metrics futurists will discuss in presentations and papers prepared in 2020. Between now and then we will need to focus our attention on what we already have but have yet to use!

## LINKS

For more information, visit the AMI Consortium web site:

[www.ami-consortium.org](http://www.ami-consortium.org)

For a white paper describing the many applications for AMI, download and read:

[www.amiproject.org/pdf/Applications-for-AMI-Technologies.pdf](http://www.amiproject.org/pdf/Applications-for-AMI-Technologies.pdf)

For an overview of the future research directions, download and read:

[www.amiproject.org/pdf/AMI-overview-prospects-for-future-research-Jan2006.pdf](http://www.amiproject.org/pdf/AMI-overview-prospects-for-future-research-Jan2006.pdf)

For technical backgrounders about AMIDA research areas, download and read:

[www.amiproject.org/pdf/SOTA-Annotation-and-Query-Jan2006.pdf](http://www.amiproject.org/pdf/SOTA-Annotation-and-Query-Jan2006.pdf)

[www.amiproject.org/pdf/SOTA-Conversational-multiparty-ASR-using-remote-mics.pdf](http://www.amiproject.org/pdf/SOTA-Conversational-multiparty-ASR-using-remote-mics.pdf)

[www.amiproject.org/pdf/SOTA-Focus-of-Attention-Jan2006.pdf](http://www.amiproject.org/pdf/SOTA-Focus-of-Attention-Jan2006.pdf)

[www.amiproject.org/pdf/SOTA-Localization-and-Tracking-Jan2006.pdf](http://www.amiproject.org/pdf/SOTA-Localization-and-Tracking-Jan2006.pdf)



AMI c/o IDIAP Research Institute  
Centre du Parc  
Av. des Prés-Beudin 20  
P.O. Box 592  
1920 Martigny - Switzerland  
[info@ami-consortium.org](mailto:info@ami-consortium.org)  
[www.ami-consortium.org](http://www.ami-consortium.org)

Tel +41 27 721 77 11  
Fax +41 27 721 77 12

### **Project directors**

Dr. Hervé Bourlard  
IDIAP Research Institute  
[herve.bourlard@idiap.ch](mailto:herve.bourlard@idiap.ch)

Dr. Steve Renals  
University of Edinburgh  
[s.renals@ed.ac.uk](mailto:s.renals@ed.ac.uk)

### **Technology Transfer**

Christine Perey  
c/o IDIAP Research Institute  
[cperey@ami-consortium.org](mailto:cperey@ami-consortium.org)