

Final Report

Transformational Impact Of “Digital Natives” On Cultures, Commerce And Societies

Submitted in fulfillment of AF Grant # FA23861014008

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14. ABSTRACT The research effort developed an informed perspective on the ?digital native? phenomenon drawing on the extant literature and leveraged interactions with recognized thought leaders. It was determined that the best way to identify and rationalize the fundamental science needed in this area would be to convene a workshop of thought leaders in this area. In November of 2009, we convened a three day workshop at the Korean Advanced Institute for Science and Engineering (KAIST) in Taejeon, South Korea. The workshop was successful by all accounts. The principal insights and areas for recommended research are reported herein.					
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Abstract: The first generation of “digital natives” is now coming of age, and soon our world will be reshaped in their image. Cultures, commerce and societies have potential to be transformed in significant and lasting ways. While few doubt the emergence and potential for impact of this transformational phenomenon, the state of science addressing this issue is somewhat lacking. The research effort developed an informed perspective on the ‘digital native’ phenomenon drawing on the extant literature and leveraged interactions with recognized thought leaders. It was determined that the best way to identify and rationalize the fundamental science needed in this area would be to convene a workshop of thought leaders in this area. In November of 2009 we convened a three day workshop at the Korean Advanced Institute for Science and Engineering (KAIST) in Taejeon, South Korea. The workshop was successful by all accounts. The principal insights and areas for recommended research are reported herein.

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1.0 Background

The first generation of “digital natives” is now coming of age, and soon our world will be reshaped in their image. Cultures, commerce and societies have potential to be transformed in significant and lasting ways.

The terms, “digital native”, “Net Generation”, “Trophy Children” are all synonymous for those born after 1980 and who grew up Immersed in the internet, video games and instant messaging and tightly-coupled to gadgets such as personal cell phones, digital music players and video cams. A government survey in Korea found that 50.3 percent of three-to five-year-olds log onto the Internet at least once a month. They were found to have first faced the Web at 3.2 years on average. Their developing minds have learned to adapt to speed and thrive on it. This generation was socialized in ways vastly different than their parents and with no precedent in human history.

Digital natives share a common global culture that is not strictly defined by age but by certain attributes and experiences related to how they interact with information technologies, information itself, one another, and other people and institutions”. Some of the dimensions on which Digital natives differ from analog natives are (from Prensky, 1998):

- o *Twitch speed vs Conventional speed*
- o *Parallel processing vs Linear processing*
- o *Random access vs Linear thinking*
- o *Graphics first vs Text first*
- o *Connected vs Stand-alone*
- o *Active vs Passive*
- o *Play vs Work*
- o *Payoff vs Patience*
- o *Fantasy vs Reality*
- o *Technology as friend vs Technology as foe*

2.0 Workshop Details

2.1 Summary: A scholarly international Workshop was planned and conducted that focused on understanding the pending transformational impacts of “digital natives” on culture, commerce and societies. This area is of growing interest and importance in academia, industry and government. The challenge is that the state of the science is somewhat weak in this area and this workshop represented an opportunity to focus on and identify high-value research targets. The WS was held in Taejeon, South Korea during November 4-7 2009. The Workshop will be held at the prestigious Korean Advanced Institute for Science and Technology (KAIST) involved 32 international attendees, of which 23 received support for associated travel/lodging expenses. National groups represented included Australia, Canada, Japan, Korea, Malaysia, Taiwan, UK and the US.

2.2 Goal of Workshop: To energize an engaging working environment and foster new relationships that stimulate fresh thinking and perspectives on this phenomenon and its probable impacts. The design of the meeting fostered opportunities to exchange and share knowledge among invited thought leaders and facilitate identification of leading researchable questions to help satisfy what we need to know?

2.3 Key questions raised for deliberation at the Workshop:

- Emerging digital cultures: Is the digital divide a cultural divide?
- “Sacred values” of the Net Generation
- Social and political implications
- Implications for collaborative and/or creative design
- Educational implications:
 - o Digital Game-Based Learning
 - o New strengths and skill sets
- Organizational impacts of Workers Who Think Differently
- Neuro-physiological and cognitive differences

2.4 Structure of Workshop:

- Five Workshop sessions, .5 day in duration with inspirational/ stimulation keynotes, invited presentations and breakout working group sessions followed by plenary team reports (see Appendix A: WS Agenda). Initial teams were assigned on day one and were encouraged to morph and self organize in subsequent breakouts.
- Four working-groups focused on:
 - o Training, Aiding and Education
 - o Creativity, Collaboration and Design
 - o Interfaces, Trust and Distributed Work
 - o Culture, Relationships and Society

2.5 Sponsors of Workshop

- Air Force Office of Scientific Research (AFOSR), US
- Asian Office of Aerospace R&D (AOARD), Tokyo, JP
- National Science foundation. Wash DC, US
- Office of Naval Research – Global, Tokyo, Japan
- US Army International Technology Center – Pacific, Tokyo, JP

2.6 What we learned:

2.6.1 Keynotes

The term, “digital native,” was coined to refer to the first generation who was born and grew up in the 21st century internet era surrounded by gadgets like computers and cell phones. Many WS participants questioned the value or the need for this label since the data does not support a existence of clear chronologic and

demographic breakpoints to illustrate a digital divide. Rather there appears to be a spectrum of contrasting capabilities and limitations. Marc Prensky's (2001) characterization of digital natives versus digital immigrants versus analog natives was similarly rejected by a number of participants.

This argument is cogently presented in a Wikipedia article which highlights the point that "not everyone agrees with the language and underlying assumptions of the *digital native*", particularly as it pertains to the concept of their differentiation". The key argument posed against this 'differentiation' is that it suggests an age-based divide in which younger people are facile with technology while older adults are challenged in varying degrees by digital technologies. More specifically, the existence of a divide is not supported by extant data and furthermore ignores the fact that "the digital universe was conceived of, pioneered, and created by the *digital immigrants*". The leading evidenced-based position is that cultural differences play a stronger role than age (Jenkins, 2007).

Other terms used to differentiate digital natives include Generation Z, Generation I (or The Internet Generation or simply, Net Generation) or, EPIC Generation because the members are **e**xperiential, **p**articipative (wiki uploaders), **i**mage-driven, **c**onnected (engaged in social networking). Within Strauss and Howe's generational theory they are known as The New Silent Generation. Those born after 2010, are being dubbed "Generation Alpha" or the "New Millennials".

For purposes of discussion, I will use the DN construct to refer those individuals who have deeply embraced and integrated the affordances and functionality enabled by digital technologies into their personal and social lives. Given this operational perspective on DNs, the WS participants generally agreed that:

- DNs are generally highly participative. They not only view wikis but also upload into them, rate their contents, and participate in their online activities.
- DNs are highly connected, many having had lifelong use of communications and media technologies.
- Digital technologies are changing
 - o our capabilities and preferences
 - o who we learn from
 - o the way we teach/train
 - o what we need to teachWith significant implications for society, business and education
- Education systems are generally lagging behind in their adaption to advances in digital technologies and internet functionality, more specifically.

Note that in 2008, 1/4 of post-secondary full-time education students were enrolled in fully online courses, with an estimated 44% in 2009.

- "Socializing" may no longer consist of getting physically together.

In her keynote address, Professor Cathy Davidson (Duke University) made a strong case that today's digitally immersed youth are misrepresented and misunderstood. "The number of reported cases of attention disorders (including ADD, ADHD, and OCD) soared in the U.S. over the past decade. Some studies now diagnose up to 25% of high school students with some form of attention disorder. She raised some provocative questions and elaborated on their implications:

"What are we diagnosing here?" "Are we diagnosing a disorder? Or do we need a new diagnosis of diagnosis?"

"Why do we believe that attention to one's task is the best and most efficient way of working? And what can the adolescent brain, which never seems to be at rest, tell us about how we actually process information and manipulate our environment?"

Prof Davidson suggested that this belief stems partly from the monumental influence of Taylor (1911) and partly because Western thinking is externally-directed. As a result, we have a paucity of information about introspection and attention. Contrary to our expectations and intuition, "Distraction is, in fact, how the brain works". *"Eighty percent of our neural energy consumption is taken up not by external distractions but by the mind talking to itself."*

"The brain is not like the machine shop, with each part having a distinctive regular function. It is tremendously redundant, and works by the principle of redundancy. Davidson astutely made the case that "our model of the brain has to change. It's not an assembly line. It's neither efficient when uninterrupted nor inefficient when multitasking." "Until recently almost all studies of attention were the equivalent of Taylor's measuring but with EEG's, PET Scans, and fMRIs. But what if the model is wrong? What if the brain is not like the assembly line at all? What if it wanders most not when it is distracted from its appointed task but when it is BORED by its appointed task?"

Impact of Video games:

"We are finally getting some decent studies of games and gamers that dispute the stupid, ridiculous, fearful, hyperbolic assumptions, post-Columbine, of what is happening to our youth" (Cathy Davidson). "Digital simulators supplement professional training for architects, engineers, pilots, surgeons, and astronauts. *America's Army* is used by the U.S. Army to train, test, and recruit soldiers."

In his presentation to the WS, Doug Gentile (U of Iowa), provided a clear data-based representation of the effects of video game technologies on health, violence and education. He reported that

- According to a recent PEW study:
 - 97% of American teenagers aged 12-17 play video games.
 - 65% say they play games with others in the same room.
 - 76% say they help others or get help while playing.
 - 44% report learning about social problems from games.
 - 52% learn about moral and ethical issues from games.
- Correlations with Exposure to Video Game Violence among Adolescents are:
 - o Hostile attribution bias ($r = .11$)
 - o Arguments with teachers ($r = .20$)
 - o Physical fights ($r = .32$)
 - o Negatively correlated with grades ($r = -.23$)
- Health Effects:
 - o Visual attention skills (e.g., Green & Bavelier, 2003)
 - o Aggression (e.g., Anderson, Gentile, & Buckley, 2007)
 - o Prosocial behaviors (e.g., Gentile et al., 2009)
 - o Obesity (e.g., Vandewater, Shim, & Caplovitz, 2004)
 - o School performance (e.g., Gentile, Lynch, Linder, & Walsh, 2004)
 - o Physical health: e.g., Seizures & repetitive stress disorders (e.g., Ricci & Vigevano, 1999)
 - o 8.5% of American gamers aged 8 to 18 would classify as pathological
- Skill improvement: laparoscopic surgeons who played video games in the past for at least 3 hours/week were 27% Faster at advanced surgical procedures, and made 37% fewer errors compared to surgeons who did not play video games (e.g., Rosser, Lynch, Haskamp, Yalif, Gentile, & Giammaria, 2004)

David Wortley Director of the Serious Games Institute (SGI) at Coventry University, Reported on multiple projects at SGI and their relevance to the DN phenomenon.

- Second Life Science City is a virtual world demonstrator and events program to engage West Midland's businesses in the use and exploration of the commercial and social networking potential of immersive virtual environments such as Second Life. The aim of this DTI project is to investigate the application of skills and technology used in video games to create more effective training solutions.
- PLaNet (Pattern Language Network for Web 2.0 Learning). The aim of this project is to facilitate the sharing of best practice in the use of new web technologies, including the use of virtual worlds, in teaching and learning.

- E-VITA - European Life Experiences – is a project focused on game-based and intergenerational learning. Within the project, individual experiences, biographies, customs, knowledge and cross-border experiences in various European countries will be documented and shared in motivating and engaging web-based Serious Games.
- FloodSim puts you in control of all flood policy decisions and spending in the UK for 3 years. Whether its deciding how much money to allocate to flood defenses, deciding where to build houses, or how best to inform people about the risk of flooding, you are in control. FloodSim is a serious game with the aims to raise awareness of the vast number of issues surrounding flood policy and Government expenditure and to increase citizen engagement through an accessible simulation.

2.6.2 Working Group Sessions

The WS participants were each assigned to one of four themed working groups based upon their CVs, bios and survey responses. The four working-groups themes (see Figure 1) were:

- Training, Aiding and Education
- Creativity, Collaboration and Design
- Interfaces, Trust and Distributed Work
- Culture, Relationships and Society

On each of the three days of the WS, two-hour long working group meetings were held in parallel followed by a plenary meeting at which each group reported on their deliberations in an open discussion format. Each successive working group was assigned several goals and stimulated with an initial set of provocative questions. The first WG session was dubbed a cognitive mixer. The intent was to enable members of each WG to self organize, to better understand one another's perspectives and to build closer relationships than would be possible in the plenary group environment. The assigned goal for WG session one was to operationally define the theme area and to establish some common ground on the "digital native" phenomenon. The objective of WG session two was to identify and discuss "prospective" transformative impacts of the DN phenomenon on the theme area as defined by the groups in WG session one. This exercise was represented as speculative and outscoping. The objective of WG session three was to rate and rank the transformative impacts identified and discussed in session two and to select the most significant impact(s) and propose, at high level, a research approach that would scientifically interrogate provide data and insights potentially useful to understanding this phenomenon.

Overall the working group reports and plenary discussions were high-energy and required moderation to wind down and maintain schedule. The findings of the individual WGs are summarized below.

2.6.2.1 Baselines: Group perspectives on the nature of DNs:

- Always ready to communicate,
- Barrier to sharing is very low,
- Ease of access to large variety of information and people,
- Expanded what can be communicated with text (emotions, emphasis, sense: “non-verbal”),
- Balance between privacy and sharing has changed,
- Approachable,
- Playful with identity and role, new definitions for “friend”

2.6.2.2 Transformative Impacts

2.6.2.2.1 Implications for society, business and education:

- Privacy: every computer is aware of me, but then the computer knows everything about me
- Social: nice to have many friends in facebook, but now we have careful about what we say and we can't say what we think
- Interfaces: DNs are very comfortable with the mouse and keyboard, so 3D interfaces may not be as good as we think in the future
- Experiences: experiencing the world via the web may provide access to far more people, but it is scary because it may mean that people will not be compelled to visit the real place
- Cognition: there is easier access to information in the future, but will this result in an reduced ability to remember anything
- Cognition: in the future you can easily edit and change an external representation (paper, 3D model, drawing), this will result in a reduced quality of the product because we don't have the habit of starting over
- Quality of output: everyone has the opportunity to share their creative products, will we have a lower common denominator (dumbing down the field)?



Workshop Structure

	Training, Aiding & Education	Creativity, Collaboration & Design	Interfaces, Trust & Distributed Work	Culture, Relationships & Society
WG #1: COGNITIVE MIXER (Baseline)				
WG #2: TRANSFORMATIVE IMPACTS (Outscope)				
WG #3: RESEARCH OPTIONS (Down focus)				

Figure 1. Working group themes and activities over the course of the Digital Natives Workshop

2.6.2.2.2 Implications for Training and Education:

- Has "... radically changed the ways in which we are able to train and educate" by changing
 - o Our capabilities and preferences
 - o Who we learn from
 - o The way we teach/train
 - o What we need to teach
- Access to resources, ways of delivering, communicating
- New possibilities of role play, authentic learning, discovery- and simulation-based learning, mobility in learning.
- Value of these capabilities needs to be understood
 - Social networking - Sensor Technologies,
 - User-created content - Alternative Interfaces
 - Gaming, Virtual Worlds - Semantic Web
 - Simulations - Mobile Learning
- What is gained vs lost as the digital becomes more pervasive?
 - o Student-centered learning vs teacher-led
 - o Structured vs unstructured learning

- Kids' time is overly structured. Where is time for free play?
 - What role does technology play in overscheduling?
 - With so much compelling content competing for attention, what gives?
- o Blending of work, education and play?
 - Edutainment
 - Expect things to be “fun”
 - Worktainment
- Challenges of understanding cause & effect
- Tech as enabler of human connections
 - o Hackerspace Movement
 - o Seth Godin, *Tribes* (See Twitter)
 - o Jono Bacon, *The Art of Community* (ibid.)
 - o Digital renaissance of people learning and making things locally?

2.6.2.2.3 Creativity, Collaboration and Design

- Generally: There is dissatisfaction with the label “digital natives” because it creates false distinctions between groups that may differ but for reasons other than digitality
- DN influence on creativity: motivation, action, and sharing/publication
- Barriers for creativity are lower;
- Creative content sharing for everyone raises questions about what is creative,
- DN technology makes collaborative communication easier (synch and asynch).
- DNs can contribute more easily due to ease of access to internet- how will ease of collaboration change creativity and design?;
- DNs are more likely to contribute to design activities;
- Design challenges are not limited to selected design experts,
- Interdisciplinary design will be more comfortable for DNs,
- Participatory design is expected for DNs;

2.6.2.2.4 Culture, relationships and Society

- Exposure to video games yields more benefits than “costs”
 - o „+... includes learning about: governance, moral & ethical issues and social problems
 - o -... includes some, smaller than expected, impact on violence and obesity
 - o Overall... Skills improvement
- Simulation will become a bigger part of work
- Agile Workforce
 - o Evaluating Job Performance

- o Competition for employees/higher turnover
 - o Right environment for the right skill set
- Work and non-work will blend
 - o Work anywhere anytime
 - o Potential stress on personal choice activities

2.6.2.2.5 Open Research questions

- Is there neuro-physiological evidence that some cognitive abilities are over-developed or are not being developed in DNs?
- Are visual-spatial areas of DNs more advanced at the expense of other areas?
- Is there neurophysical evidence that some cognitive abilities are not being developed in DNs?
- Are visual-spatial areas more advanced at the expense of other areas?
- What computational, cognitive, and social substrates and abstractions enable and facilitate the design of systems that enhance creativity?
- What role do the social and interaction cues that humans rely on when interacting with one another play in collaborative design environments and other creative tasks?
- How can we define the agile work place to take advantage of the DN?
- Eight core technologies as vehicles for research:
 - o Social networking
 - o User-created content (Web 2.0 and beyond)
 - o Gaming, Virtual Worlds
 - o Simulations
 - o Sensor Technologies, Internet of Things
 - o Alternative Interfaces
 - o Semantic Web
 - o Mobile Learning

2.7 Meeting evaluation

Twenty out of 26 participants responded to the survey. Tallied results are shown below followed by excerpted comments.

MEETING EVALUATION

Etiology and Impact of "Digital Natives" on Cultures, Commerce and Societies KAIST, Daejeon, SK -- 3-6 November 2009

Circle one number for each statement.	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Meeting Preparation					
1. I was provided sufficient information in time to plan and prepare for this workshop.	0	0	0	8	12
2. I understood why this meeting was being held and the specific outcomes expected.	0	0	4	8	8
3. I understood what was expected of me as a participant, and what was expected of the other participants	0	0	1	7	12
4. I understood the intended flow of the meeting (e.g., agenda, schedule, design, etc.) and when it would end.	0	0	0	7	13
Meeting Execution					
5. Most participants listened carefully to each other.	0	0	2	8	10
6. Most participants expressed themselves openly, honestly, and directly.	0	0	2	8	10
7. Things generally proceeded as intended (e.g., the agenda was followed, it ended on time) and the meeting achieved its intended purpose.	0	0	1	6	13
8. My participation contributed to the outcomes achieved.	0	0	2	9	11
9. Overall, I am satisfied with this meeting and I feel my time here has been well spent.	0	0	0	6	14
Comfort & Logistics					
10. The meeting site was effective & comfortable	0	0	0	7	13
11. There was sufficient time provided for social interaction and networking	0	0	2	4	14
12. Food and beverages met my needs	0	0	1	4	15
Additional comments: _____					

Continue on back					

8.1 Additional comments from evaluation

- *Excellent event and use of my time and involvement*

- *Very successful on at least two fronts – Intellectually stimulating – Provocative and facilitating of collaborations*
- *Needed more unstructured time for networking...*
- *Fantastic opportunity! Hopefully linkages will grow from this. One of the key things that come to my mind is the lack of participation from China and India. Can we make inroads there?*
- *Fabulous meeting! The unpredictable line up made it work. Thanks for inviting me!*
- *Things I learnt include that the internet can smell a fake, that pictures of brain scans will make my research reports authoritative and that I want to play Halo.*
- *A really useful group discussion. I will be interested to see how/if this leads to collaborative research.*
- *ON materials, it would have been nice if the printed booklet had been distributed the night before... Goals of the organizers not completely clear. Overall, organizers did a great job! However, two areas of misstep (to start) (1) the idea of digital natives was (to a degree) flawed. Perhaps a different jumping off point would have been more serviceable. Secondly, Europe was particularly absent and really needed to be heard from to better understand this phenomenon.*
- *Needed more unstructured time for impromptu conversation since workgroup membership stayed constant. Recommend rotating group assignments frequently.*
- *I really didn't really understand why the meeting was being held until the end of the first day.*
- *Food in general excellent and certainly more than enough quantity but a couple of breaks to other cuisines would have been nice.*
- *I've made some great connections and gained great insights (and references) to a burgeoning and critical subject.*
- *Very well organized! Very Interesting! Learned lots and hope others have as well.*

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Korea Times Monday, November 6, 2006 By Kim Tae-gyu

www.marcprensky.com/writing/default.asp

4.0 Appendix

- 1. WS Agenda**
- 2. Bios of participants**

AGENDA
Etiology and Impact of "Digital Natives" on Cultures, Commerce and Societies
KAIST, Daejeon, SK
3-6 November 2009

December 3rd, 2009 (Tuesday)

19:00	Welcoming Reception	Riviera Hotel Yuseong, Daejeon, South Korea
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December 4th, 2009 (Wednesday)

08:00	Leave for KAIST from the Hotel (by a chartered bus)	
08:30	Welcome	Soo-Young Lee
08:45	WS Theme, Orientation & Objectives	Ken Boff
09:15	Self-Introductions	All
10:15	Coffee	
10:30	Keynote: <i>The kids are all right: Paying attention in our multi-tasking, multi-distracting, media-stacking always-on age</i>	Cathy Davidson
11:30	Sponsor Perspectives	Sponsors
12:00	Lunch (Faculty Club; 10 minutes on foot)	
13:15	Presentation: <i>Impact of immersive technologies on next generation learners</i>	David Wortley
14:00	WS Rules of Engagement	Ken Boff
14:15	WG Session 1 - Cognitive Mixer: Perspectives & Positions	Sub-Groups
15:00	Informal Coffee	
16:15	WG Reports & Plenary Discussion	All
17:30	Leave from KAIST (by a chartered bus)	
18:00	Dinner: Manna (Korean Restaurant)	
20:00	Return to Hotel (5 minutes on foot)	

December 5th, 2009 (Thursday)

08:00	Leave for KAIST from the Hotel (by a chartered bus)	
08:30	Presentation: <i>Enhancing creativity and implications for design cognition</i>	Mary Lou Maher
09:15	WG Session 2 - Transformative Impacts	Sub-Groups
10:00	Coffee	
11:00	WG Reports & Plenary Discussion	All
12:00	Lunch (Faculty Club; 10 minutes on foot)	
13:15	Presentation: <i>Digital displacement (working title)</i>	Roland Kelts
14:00	Presentation: <i>The behavioral effects of games: Five dimensions</i>	Doug Gentile
14:45	Strategic Pause	
15:00	Coffee	
15:15	WG Session 3 - Research challenges & Options	Sub-Groups

17:15	WG "Flash Status" Reports
17:30	Leave from KAIST (by a chartered bus)
18:10	Dinner: Daegamun (Korean Restaurant)
20:30	Return to Hotel (by a chartered bus)

December 6th, 2009 (Friday)

08:00	Leave for KAIST from the Hotel (by a chartered bus)	
08:30	Presentation: <i>The politics of the personal: mobile and social media in the Asia-Pacific</i>	Larissa Hjorth
09:10	Researchable Concepts and Strategy Options: WG Reports	All
10:00	Coffee	
10:15	WG-Reports Continued	All
11:00	Next Steps & Closing Remarks	All
12:00	Leave for lunch from KAIST (by limousine buses)	
12:20	Lunch: Yukmidaega (Korean Restaurant)	
13:20	Limousine buses to Seoul	
16:00	Technical Tour (Samsung d'light, Seoul)	All
17:50	Leave from Samsung d'light (by limousine buses)	All
18:20	Dinner with Special Cultural Performance: Pulhyanggi (Korean Restaurant)	
20:20	Return to Hotel (by limousine buses)	

APPENDIX 2: BIOS OF DIGITAL NATIVES WORKSHOP PARTICIPANTS

Plus Survey Responses

KAIST, Taejeon, South Korea
4-6 November 2009



David J. ATKINSON, PhD is Program Manager for Information Sciences & Mathematics in the Asian Office of Aerospace Research & Development, Air Force Office of Scientific Research. In this position he is responsible for development and oversight of basic research projects in Pan-Asia and establishing international research collaborations. Atkinson is on loan to the US Air Force from the Institute for Human and Machine Cognition (IHMC) where he is a research scientist. Prior to joining IHMC in October 2008, he worked 20 years at the California Institute of Technology (Caltech), Jet Propulsion Laboratory (JPL), the lead NASA Center responsible for robotic space exploration missions. He was on special assignment at NASA HQ, Exploration Mission Systems Directorate where he served as a program architect and executive of the Lunar Precursor Robotic Program (LPRP). At JPL, Dr. Atkinson was Deputy Division Manager of the Information Technologies and Software Systems Division where he was responsible for the development, delivery and operations of major information systems, spacecraft software for JPL's flight projects, and a R&D portfolio spanning artificial intelligence, robotics, high-performance computing and graphic displays, data-mining, augmented reality, and software engineering. Dr. Atkinson is an expert in systems autonomy and automation, a notable early contribution being the invention of the intelligent SHARP (now SHINE) system which provided real-time monitoring and diagnosis operations support for Voyager and Magellan telecommunications as well as the Galileo power subsystems and is now used in commercial industry for a variety of applications. Dr. Atkinson has received the NASA Exceptional Service Medal as well as numerous NASA Group Achievement Awards, Space Act Awards, and multiple recognitions by the NASA Inventions Board. Dr. Atkinson is a member of the AIAA, AAS, IEEE, and ACM, and has over 45 publications. An entrepreneur, Dr. Atkinson was Co-founder, Director, and former CEO of a successful startup in 1995 called PCNAAlert.com®, wholly owned as of August 2007 by IHS (NYSE: IHS). Dr. Atkinson is a Docent and a Doctor of Technology (dr.techn) in Computer Systems Engineering from Chalmers University of Technology, Göteborg, Sweden (where he also served as a Visiting Scientist), the Master of Science (MS) and Master of Philosophy (MPhil) degrees in Computer Science from Yale University and the Bachelor of Arts (BA) in Psychology from the University of Michigan. <http://davidatkinson.is.dreaming.org/gnaritas@mac.com>

How the DN theme intercepts with primary research interests:

With a view towards human-computer partnership in problem-solving, I am interested in the total cognition of systems that are composed of both humans and machines. In the past, work has focused on making a harmonious fit of computers to the cognition of human users. Functions were allocated to computer or human without regard for the cognitive capabilities of each in a fully integrated system – human functions were assumed as a baseline and machines were designed to fit. The cognitive capabilities of computers have not been a driving force in systems design. We are in an era where this is changing as computing becomes exceptionally capable. An partnership between

human and computer will likely have cognitive capabilities that greatly exceed the sum of the capabilities of each. Digital Natives are integrating computing and information technologies into their way of thinking as no one has before. My focus is on this intersection of human cognition and the accelerating capability of computing in the context of real-world demands for problem solving.

Research challenges that the DN phenomenon poses for your area of interest.

What do DNs think about machine intelligence and autonomous systems, and what about this technology will be easier or harder for them to accept and why?

Are DNs capable of wholly new methods of interacting with computers (e.g., in systems) that will allow dramatic – possibly disruptive – improvements in problem solving (such as “human computation” and “social computation”)?

Will DNs embrace multi-sensory brain computer interfaces (BCI), including both invasive and external methods and including artificial stimulation of cortical structures as well as detections of cortical structure activation? In this context, can we close the signal-to-signal loop around perception and thus create a useful symbolic language for BCI-based human-computer interaction rooted in neuro-cognition?

Publication that best represents the vector of principal research interests.

As yet unpublished in this topic area. I am happy to share a recent internal AFOSR report I authored on these topic



Jeffrey BOASE is an assistant professor in the Dept of Communication at Rutgers University. His research focuses on how individuals use the communication technology to maintain and build their personal networks. Dr. Boase has co-designed several large-scale surveys in America, Canada and Japan. His most recent work examines the social utility of web-enabled mobile phones in Japan, with a focus on how personal network dynamics shape the extent to which this technology is used to bridge and bond with social ties. *Keywords: social networks, externality, rural, internet, digital divide* jboase@rci.rutgers.edu

How the DN theme intercepts with primary research interests:

I have researched how young people in Japan use mobile phone e-mail to bond with existing relationships and build new ones.

Research challenges that the DN phenomenon poses for your area of interest DN shows that life stage has strong implications for how we understand the significance of communication technology for social relationships. Although including life stage can make narratives about this topic complex, ignoring life stage leads to misleading generalizations.

Publication that best represents the vector of principal research interests.

Boase, J., & Kobayashi, T. (2008). Kei-Tying Teens: Using Mobile Phone Email to Bond, Bridge, and Break with Social Ties – A Study of Japanese Adolescents. *International*



Ken BOFF distributes his time as Principal Scientist with the Tennenbaum Institute, Georgia Institute of Technology, Scientific Advisor to the Asian Office of Aerospace Research and Development (Tokyo), and independent consulting. He recently retired after a decade as the US Air Force Research Laboratory Chief Scientist for Human Effectiveness. In this position, he was responsible for the technical direction of a multi-disciplinary R&D portfolio encompassing individual and organizational behavior, training, protection and the bio and human-engineering of complex systems. He is best known for his work on

understanding and remediating problems in the transition of research to applications in the design, acquisition, and deployment of systems and the value-centered management of R&D organizations. Holder of a patent for Rapid Communication Display technology, Boff has authored numerous articles, book chapters and technical papers, and is co-editor of "Organizational Simulation" (2005) and "System Design" (1987), senior editor of the two-volume "Handbook of Perception and Human Performance" (1986), and the four-volume "Engineering Data Compendium: Human Perception and Performance" (1988). Boff actively consults and provides technical liaison with government agencies, international working groups, universities and professional societies. He is a graduate of Columbia University and a Fellow of the Human Factors & Ergonomics Society and the International Ergonomics Association. Ken.boff@ti.gatech.edu

How the DN theme intercepts with primary research interests: The Tennenbaum Institute is concerned with understanding and influencing the transformation of complex socio-technical systems (e.g. organizations, enterprises and massively complex systems such as national health care or air-traffic management). Typically, the impetus for transformation arises from disruptive innovations in technology, business practice or from the competitive need to align cultures, procedures and practice following mergers and acquisitions of complex enterprises. The "digital native" phenomenon suggests a significant, unprecedented source for disruptive change of the fundamentals of society, education, industry, the office and the military that needs to be understood and leveraged to achieve effective outcomes in strategic transformation.

Research challenges that the DN phenomenon poses for your area of interest We need to be redefining the capabilities, roles and expectations of "users" in the design of interfaces, organizations and complex enterprises. The present "user" base is comprised of, at least, three concurrent, somewhat co-existing populations of Analog Natives, Digital immigrants and Digital natives. Research is needed to better understand the salient differences between these populations and, in particular, how these differences may contribute to variance in value outcomes.

Publication that best represents the vector of principal research interests.

Boff, K.R. (2006). Revolutions and shifting paradigms in human factors and ergonomics. *Applied Ergonomics*. 37, 391-399 (Lead article for the 50th Anniversary Issue of the journal based on a Keynote Address at the 50th Anniversary meeting in Maastricht, NE. July 2006).



Rita M BUSH is a Program Manager in the Intelligence Advanced Research Projects Activity (IARPA), in the Office of the Director of National Intelligence (ODNI). She previously served as Division Chief of the Information Exploitation (InfoX) Research Division in the Disruptive Technology Office (DTO), where she oversaw an extensive research portfolio in a variety of topics of interest to the Intelligence Community, including natural language understanding, video exploitation, collaborative work environments, social network analysis, modeling and simulation, and information visualization.

Her current research interests include novel human-computer interaction technologies and virtual worlds. Prior to becoming a federal government employee, Dr. Bush was employed as a Program Manager at AT&T and at Telcordia Technologies. She began her career as a researcher in Human Factors at Bell Labs. She holds a Ph.D. in Experimental Psychology. rita.m.bush@ugov.gov

How the DN theme intercepts with primary research interests:

I am a government program manager funding social science research in Virtual Worlds (and on-line games). I have 2 programs at this time (the first is in-progress; the second is still a concept):

- 1) Starting from the premise that Real World (RW) characteristics are reflected in Virtual World (VW) behavior, the Reynard program seeks to determine behavioral indicators in VWs that are predictive of RW characteristics of the users, and
- 2) Experiences in VWs may in turn have an effect on RW attitudes, beliefs, and behaviors. What are the specific mechanisms that enable these RW changes, and how might these VW mechanisms be manipulated to have long-term, persistent RW effects?

In both programs, the Digital Native variable is one that will be an item to be researched.

Research challenges that the DN phenomenon poses for your area of interest:

We must disambiguate the Digital Native variable from a simple “age” or “generational” variable. Not all youth will necessarily be Digital Natives, but how do we operationally define what we mean by “Digital Native” so that we can objectively measure it?

Publication/Communique that best represents the vector of principal research interests:

http://www.iarpa.gov/IARPA-BAA-09-05_Amend2_090527.pdf



Jeff BUTTERFIELD, PhD, is the department chair of the Information Systems department at Western Kentucky University. Dr. Butterfield is actively involved in the development of on-line learning technologies and speaks and trains nationally on the subject. In particular, Jeff’s research examines developing *tele-presence* as a means of enhancing the richness and interactivity of distance training and education. His research also includes the

development of testing and assessment techniques for remote students with particular attention to maintaining the integrity of the process. Jeff is the author of the “Soft Skills for a Digital Workplace” series. These titles are part of his work teaching professional and managerial skills to technologists, engineers, and creative workers.

How the DN theme intercepts with primary research interests: Most of today’s college faculty are either Baby Boomers (born: 1946-1964) or Generation X’ers (born: 1965-1978) and have grown up with similar educational experiences. There is increasing concern in the academy about the current generation of students. Many faculty members assume that today’s student is less motivated, less capable, and invests less effort in their studies. Some are frustrated that their pedagogical approach, which has served them well for decades, no longer seems effective. Although there is no single reason for this change in perception and performance, some of the characteristics that have been observed in Millennials (born 1979-199X) provide some explanation.

I have been actively involved with on-line/distance education for over a decade. My initial motivation was to tap into a growing market of adult learners who were seeking higher-education opportunities as a means of career advancement or development. Much of my work has involved developing specific technologies (e.g., streaming interactive video) and pedagogical approaches to meet the unique needs of this group. An unintended consequence has been significant growth in traditional-age student enrollment. Much of what is necessary for working adult learners (e.g., on-demand learning content, interactive educational materials, flexible schedules, etc.) is particularly attractive to Millennials. WKU (and many other universities) is seeing incredible growth in online/distance courses from 18-24 year old students who live on campus. Not only are students choosing to register for courses with alternative delivery modalities, but they are increasingly demanding similar options in their on-ground courses.

This has significant implications for higher education as it seeks to maintain its relevance and meet the demands of both its students and other interested stakeholders (e.g., the state).

Research challenges that the DN phenomenon poses for your area of interest: I strongly believe that higher education will need to change itself dramatically in the next decade or other alternatives will arise. We have seen other information industries (e.g., Newspapers) that have been seriously affected by technology and changing market demands. What higher education doesn’t know is how best to educate the current generation of students. Millennials can’t even define it themselves, but do seem to respond favorably when they experience it.



Shanton CHANG, PhD is a senior lecturer in Change Management and Social Impacts of Information Systems at the Department of Information Systems, University of Melbourne. His current primary areas of research include the Social Aspects of Broadband Technology Adoption, Online Behaviour and Online Prosumers, Information Security Culture, Information Needs and the Relationship between Cultures and Information Technology. he is particularly

interested in how broadband technologies and Web 2.0 has impacted on education and health. He is also a recipient of a number of Awards for Excellence in Teaching from the University. Shanton consults on online behaviour of young people, online education and interaction across cultures. slwc@unimelb.edu.au

How the DN theme intercepts with primary research interests:

My primary research interests are in Peoples' Online Behaviour, with some focus on young people (Digital Natives). I am interested in what their internet use patterns are and how they engage with each other and the technology. I am also interested in the social impacts that high speed broadband is having on society in general.

Research challenges that the DN phenomenon poses for your area of interest:

Doing research online is a relatively new phenomenon and I think the developing research methodologies continue to be challenging but interesting. In terms of the field of research, the technology and innovation is moving at a fast pace and there's always new things, new behaviours to do research in. However, there's clearly a lack of strong theory building in the area because of the shifting platform and technologies. This can be a challenge from a research point of view.

Publication that best represents the vector of principal research interests.

Gray, K., Chang, S. and Kennedy, G. (upcoming, accepted) Use of social web technologies by international and domestic undergraduate students: implications for internationalising learning and teaching in Australian universities, *Technology, Pedagogy and Education*.

Alzougool BMH, Chang S & Gray K. (2008), Towards a comprehensive understanding of health information needs. *Electronic Journal of Health Informatics*. Vol 3 (2): 1-10.



Fang CHEN, PhD worked in Beijing Jiaotong University 1995-1999 as Associate Professor, the Deputy Director of the Institute of Information Science and Dean of Faculty of Electronic and Information Engineering. She began her career in industry in 1999 as senior researcher and team leader in Intel China Research Centre. She joined Motorola in 2000 as a principal researcher, and was the founding research manager of the Speech and Language Generation Research Lab of Motorola China Research Centre. She moved to Australia in 2002 to work for the Motorola Australian Research Centre, where she chaired the Patent and Publication Committees. She joined NICTA in 2004 and is currently the research group manager of the making sense of data theme in NICTA ATP research Lab. She also has appointment of visiting professor in The University of New South Wales, Honorary Associate in The University of Sydney and Adjunct Professor in Beijing Jiaotong University. Her main research interests are in multimodal human-machine interaction, cognitive load modeling, and digital signal processing. She has researched and developed in many aspects of multimodal human-machine interaction, such as speech and natural language dialogue, manual gesture and pen gesture recognition, emotion, usability and human factors. In past 5 years, she led the team researched in objective non-intrusive cognitive load measurement and created cognitive load modeling through users' multimodal behavior. She has more than 100 refereed publications, 5 issued patents and 20 pending patent filings.

How the DN theme intercepts with primary research interests: My primary research interests are on multimodal interfaces and cognitive science. DN theme has lots of interesting perspectives, such as: Neuro-physiological and cognitive differences – what the cognitive differences are and whether these differences can be captured/explained physiologically or by neuroscience. Education implication – what the most effective way of learning is, how to design the learning materials, how the modality effect plays on the new generation, what the missing skill sets are (especially on thinking/problem solving/working under pressure etc)

Research challenges that the DN phenomenon poses for your area of interest
Neuro-physiological and cognitive differences - Education implications

Publication that best represents the vector of principal research interests.

Yin, B., Chen, F., Ruiz, N. and Ambikairajah, E., "Speech-based Cognitive Load Monitoring System", Proc. IEEE International Conference on Acoustic, Speech and Signal Processing (ICASSP'08), Las Vegas, March/April 2008, pp. 2041-2044.



Cathy N. DAVIDSON'S work for the last decade has focused on the role of technology in the twenty-first century. In 1999 she helped create ISIS (the program in Information Science + Information Studies) at Duke and, in 2002, co-founded HASTAC (Humanities, Arts, Science, and Technology Advanced Collaboratory, pronounced "haystack"). HASTAC administers the annual HASTAC/MacArthur Foundation Digital Media and Learning Competition, part of the \$50 million MacArthur Foundation's Digital Media and Learning Initiative. Her MacArthur research (with HASTAC co-founder David Theo Goldberg) appears as a MacArthur Report, *The Future of Learning Institutions in a Digital Age* (available for purchase or download from MIT Press). The book-length version, *The Future of Thinking: Learning Institutions in a Digital Age*, will be published by MIT Press in 2009. Davidson blogs regularly as Cat in the Stack at www.hastac.org.

From 1998 until 2006, Davidson served as Vice Provost for Interdisciplinary Studies at Duke, the first person to hold this as a full-time position at any university, and in this R & D role oversaw more than sixty interdisciplinary programs and institutes, including the Center for Environmental Solutions, the Program in Neuroeconomics, Fitzpatrick Center for Interdisciplinary Engineering and Applied Medicine, the Arts, Culture, and Technology (ACT) Warehouse, Duke Immersive Virtual Environments (DIVE), Brain Imaging and Analysis Center, and many more. Among the interdisciplinary programs she and her colleagues helped create at Duke is the Center for Cognitive Neuroscience. The changes in this rapidly growing and by no means unitary field, along with Davidson's ongoing work with the MacArthur Foundation Digital Media and Learning Initiative and with HASTAC, are the background and motivation for *The Rewired Brain: The Deep Structure of Thinking in the Information Age* (forthcoming, Viking Press, 2010).

Davidson is the author or editor of some eighteen books on wide-ranging topics including technology, the history of reading and writing, literary studies, travel, Japan, Native American writing, electronic publishing, and the future of learning in a digital age. Her *Revolution and the Word: The Rise of the Novel in America* (Oxford UP) is a widely-praised study of the impact of the new technology of mass printing on literacy, education, culture, and the new American democracy in the late 18th century. With

documentary photographer Bill Bamberger, she wrote the prize-winning *Closing: The Life and Death of an American Factory* (Norton), which culminated in an exhibit at the Smithsonian Museum of American History. Davidson has served as the editor of the leading journal in her field, *American Literature* (1989-1999), and President of the American Studies Association. She is currently the Ruth F. DeVarney Professor of English and the John Hope Franklin Humanities Institute Professor of Interdisciplinary Studies at Duke University. cathy.davidson@duke.edu

How the DN theme intercepts with primary research interests:

I co-founded HASTAC (pronounced “haystack,” and a long acronym for Humanities, Arts, Sciences, and Technology Advanced Collaboratory) in 2002 out of an insight that, over the last two decades, we have all been changed by our digital age but these changes are not yet sufficiently reflected in conceptions, standards, methods of assessments, or our institutions (educational and otherwise). U.S. Department of Labor Statistics indicate that the average American now changes careers three to seven times. How are we preparing students for a changing, global, interconnected, interactive future? The theme of this conference is central to my work and so is its location and its participants. I come to learn more from a global perspective in one of the most interconnected locations on the planet.

Research challenges that the DN phenomenon poses for your area of interest

I am especially interested in how youth in Daejeon or in Chongqing use and think about media as compared to youth in Tokyo or New York—or Peoria. In other words, what features are generational, what technological, what cultural? What am I missing when I analyze “youth today” because of my own limited knowledge outside a few countries (U.S., Canada, Japan primarily).

Publication that best represents the vector of principal research interests.

Cathy N. Davidson and David Theo Goldberg, *The Future of Learning Institutions in a Digital Age*, MacArthur Foundation Research Paper Series (MIT Press, 2009).

And some recent blogs at www.hastac.org where I blog regularly as “Cat in the Stack” on new media, youth, cognition, and learning.

“How to Crowdfund Grading” and “Follow-Up”: <http://www.hastac.org/blogs/cathy-davidson/how-crowdfund-grading> and <http://www.hastac.org/blogs/cathy-davidson/crowdfunding-grading-follow>

“Are Multitaskers Worse at Multitasking?” <http://www.hastac.org/blogs/cathy-davidson/are-multitaskers-worse-multitasking>



Peter FRIEDLAND'S career has focused on interdisciplinary technology research, development, and application with substantial accomplishments in academia, industry, and government. He received his PhD in Computer Science from Stanford in 1980 for pioneering artificial intelligence research in the areas of planning, knowledge representation, and expert systems. He applied this

work to the then emerging discipline of molecular genetics leading to the creation of a user community of several thousand academic and industrial scientists, and the funding of a NIH-sponsored National Research Resource, BIONET. He also co-founded two companies while at Stanford: IntelliGenetics, the first bioinformatics company, and Teknowledge, the first expert systems technology and training company. Both became public companies in the early 80's.

In 1987, Dr. Friedland joined NASA Ames Research Center to create what became the government's largest and most highly-regarded Intelligent Systems R&D laboratory. The hallmark of the laboratory was the ability to simultaneously conduct state-of-the-art research while also fielding applications to all of the primary NASA missions and Centers. He left Ames in 1995 to form and lead his third company, Intraspect Software, an early knowledge management systems provider to the point of 200 employees and over \$30M in sales. Intraspect was sold to Vignette Software in 2003, and Dr. Friedland rejoined Ames as Chief Technologist where he supervised a wide range of technology development activities in emerging areas like nanotechnology. He is now an independent technology strategist and consultant with clients in academia, government, and aerospace. Dr. Friedland is a Fellow of the American Association of Artificial Intelligence, and a recipient of the NASA Outstanding Leadership Medal and the Feigenbaum International Medal for Expert Systems Applications.
peterfriedland@gmail.com

How the DN theme intercepts with primary research interests:

I'm very interested in two topics related to the DN theme:

1. How humans can most effectively interact with intelligent computational assistants to solve complex problems.
2. Can human creativity in such areas as design (whether of physical artifacts or intellectual plans, like the design of scientific experiments) be emulated and/or amplified by computational tools?

Research challenges that the DN phenomenon poses for your area of interest

How do you design human-machine and human-avatar interaction environments to maximize problem solving potential in such areas as design? What new underlying technologies are necessary to fully realize that potential?

Publication that best represents the vector of principal research interests. This is a fairly old paper, but it best describes one of my principal interests in modeling human-problem solving.

Peter E. Friedland and Yumi Iwasaki, "The Concept and Implementation of Skeletal Plans," *Journal of Automated Reasoning*, Vol. 1, No. 2, 1985, pp. 161-208.



Douglas GENTILE is a developmental psychologist, and is an assistant professor of Psychology at Iowa State University and the Director of Research for the National Institute on Media and the Family. His experience includes over 20 years conducting research with children and adults. Dr. Gentile has authored numerous studies, including "The Effects of Violent Video Game Habits on Adolescent Aggressive Attitudes and Behaviors," "A Validity Test of Movie, Television, and Video Game Ratings," and "A Normative Study of Family Media Habits." He is the editor of the book *Media Violence and Children* (2003, Praeger

Press), and co-author of the book *Violent Video Game Effects on Children and Adolescents: Theory, Research, and Public Policy* (2007, Oxford University Press). Dr. Gentile runs the Media Research Lab at Iowa State University where he conducts research on media's impact on children and adults. As the leader of this effort, Dr. Gentile develops and conducts research projects designed to give parents and other

caregivers the kind of information they need and want to make informed media choices for their children. Dr. Gentile speaks regularly to community, education, health care, and parent groups. Praised as an engaging and energetic speaker, he speaks about issues such as the connection between media and brain development, the effects of television and video game violence, the effects of tobacco and alcohol advertising on adolescents, and the psychology of advertising.

He has been featured on such shows as National Public Radio's *Morning Edition* and Public Radio International's *To the Point*, and his work has been reported in the *New York Times*, *Washington Post*, *Los Angeles Times*, as well as numerous other newspapers and television stations.

Dr. Gentile received his doctorate in child psychology from the Institute of Child Development at the University of Minnesota. Prior to his work at Iowa State University and the National Institute, he worked as a market researcher, a math instructor, and served as test developer and data analyst for Educational Testing Services in Princeton, New Jersey. He is on the editorial board of the *Journal of Applied Developmental Psychology*. He lives in Ames, Iowa with his daughter, Lauren. dgentile@iastate.edu

How the DN theme intercepts with primary research interests:

I am interested in how people use media, broadly defined, and how those media can modify human cognitions, affect, and behaviors. I am interested in several aspects of media effects, including whether individual differences interact with media content, how we can assess short-term and long-term effects, how children, adolescents, and adults are affected, and what psychological mechanisms mediate the effects.

I study many media and many effects, including:

- the effects of violent and prosocial video games,
- the benefits of video games for skill development,
- video game and Internet "addiction,"
- the effects of television content on viewer attitudes and behaviors,
- the effects of music,
- the effects of advertising,
- screen time as one risk factor for childhood obesity,
- ratings for media products, and
- the intersection of media research and public policy.

Research challenges that the DN phenomenon poses for your area of interest

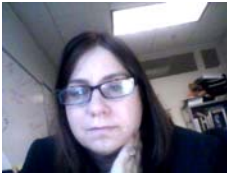
As media colonize our living and work spaces and our time, understanding the effects becomes more important. Yet, it becomes more difficult to discriminate between normal and problematic use. It also becomes more difficult to measure individual differences validly to understand how the effects may be moderated by those individual differences.

Publication that best represents the vector of principal research interests.

Gentile, D. A., Saleem, M., & Anderson, C. A. (2007). Public policy and the effects of media violence on children. *Social Issues and Policy Review*, 1, 15-61.

Gentile, D. A., Anderson, C. A., Yukawa, N., Saleem, M., Lim, K. M., Shibuya, A., Liau, A. K., Khoo, A., Bushman, B. J., Huesmann, L. R., & Sakamoto, A. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from

correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, 35, 752-763.



Rebecca GOOLSBY, Ph.D. is an anthropologist and program officer for the Office of Naval Research. She currently directs a program in human dynamics research focusing on data gathering issues and social analysis technologies for theater security cooperation. She has an adjunct research appointment at the University of Texas at Austin in the Institute for Advanced Technologies to support her

ONR-funded research on the mission space analysis needs of Combatant Commands in socio-cultural data, technologies and training. Key program concerns are social media and online/offline behaviors as they affect human security concerns, social network analysis technologies and scientific research for the social analysis of terrorist organizations, and development of methodologies for data gathering for computational approaches to human security in non-permissive environments and the measurement of progress in conflict environments. She has published articles on the Indonesian terrorist group Jemaah Islammiya, on e-democracy, blogging and twitter, and on the ethics of military funding among other issues. She is a former Fulbright Scholar to Thailand, with areal specialties in S.E. Asia and West Africa, and is currently a research fellow at the Forward Research Base in Afghanistan. rebecca.goolsby@navy.mil

How the DN theme intercepts with primary research interests: Current military operators are divided between digital immigrants and digital natives. Each has very different perspectives on key issues involved in the development of new data resources and modeling. Issues like privacy, transparency, and real-time data collection affect them differently due to the differences of the life experiences. In developing new data resources, particularly resources drawn from crowd sourcing techniques, the generations approach it differently. Understanding how to relate to “the other generation” is key in developing new resources that make sense and are accepted by all of them.

Research challenges that the DN phenomenon poses for your area of interest:

Digital natives are ready to expose just about everything—the new kinds of social behavior we will see as we develop new social media is going to be exciting and challenging to watch.

Publication that best represents the vector of principal research interests.

Rebecca Goolsby. (2009). Lifting Elephants: Twitter and Blogging in Global Perspective.” In Social Computing and Behavioral Modeling. Springer Publications.

Rebecca Goolsby (forthcoming) Social Media as Crisis Platforms. IEEE Special Edition on Social Media.



Steve HAN has joined GSCT from January 2009 as a full-time professor. He used to be an adjunct professor since 2006 and has been a leader in IT industry in Korea and one of the evangelists for web 2.0 technologies and services. At KAIST GSC, he and his students are researching on social computing area such as tagging, trust/reputation, recommendation, social network analysis, and etc. Most of his researches are related to the combination of the computer science and social science to explain people's activities on the web. He will serve as a program committee

member of forthcoming BLOG TALK ASIA 2009 in Jeju Island.

He founded several companies and worked as a corporate executive since 1999 including VenturePort Inc., Daum Communication, and Opinity AP Inc. From 2006, he started a peer-review sharing service called REVU, which is one of the earliest web 2.0 services in Korea. In late 1990s, he worked for Samsung Electronics as a corporate strategist and product manager. One of the world-wide famous MP3player called YEPP was developed by his team in 1997. Born December 5th, 1960, he has two sons and a wife living in Vancouver, Canada. He graduated from Seoul National University and received his Master and Ph.D. degrees from KAIST Computer Science.
stevehan@kaist.ac.kr

How the DN theme intercepts with primary research interests:

Understanding and modeling the behavior of digital natives are very important to the online community, social networking services, and social media. As my research is to approach computationally to modeling and predicting the user behaviors for those applications, the characteristics of digital natives can be very fundamental issues to understand why DN act, respond, participate, and be motivated in particular applications. Analyzing and finding out the technological components to drive them would be very helpful to design new services and estimate the user response.

Research challenges that the DN phenomenon poses for your area of interest

- Cultural difference and dynamics of SNS in Korea
- Difference in digital storytelling of DN in Korea
- The way of use of social media and its characteristics from the perspectives of understanding DN in Korea

Publication that best represents the vector of principal research interests:

- Suyeon Kim, S. Han, "An Analytical Way to Find Influencers on Social Networks and Validate their Effects in Disseminating Social Games", The 2009 International Conference on Social Networks Analysis and Mining (ASONAM 2009), Athens, Greece, July 2009



Larissa HJORTH is artist, digital ethnographer and Senior Lecturer in the Games and Digital Art Programs at RMIT University. Since 2000, Hjorth has been researching and publishing on gendered customizing of mobile communication, gaming and virtual communities in the Asia-Pacific — these studies are outlined in her book, *Mobile Media in the Asia-Pacific* (London, Routledge, 2009). Hjorth has published widely on the topic in national and International journals in journals such as *Games and Culture journal*, *Convergence journal*, *Journal of Intercultural*

Studies, *Continuum*, *ACCESS*, *Fibreculture* and *Southern Review* and recently co-edited two Routledge anthologies, *Games of Locality: Gaming cultures in the Asia-Pacific* (with Dean Chan) and *Mobile technologies: from Telecommunication to Media* (with Gerard Goggin).

In 2007, Hjorth co-convened the International *Mobile media* conference with Gerard Goggin (www.mobilemedia2007.net) and the *Interactive Entertainment* (IE) conference with Esther Milne (www.ie.rmit.edu.au). In 2009 she began her ARC discovery fellowship (with Michael Arnold) exploring the role of the local and online with communities in the Asia-Pacific region. This three year cross-cultural case study will focus on six locations — Tokyo, Seoul, Shanghai, Singapore, Manila, and Melbourne. larissa.hjorth@rmit.edu.au

How the DN theme intercepts with primary research interests:

Having worked on mobile media and virtual communities in the Asia-Pacific since 2000, my research parallels those of the workshop in terms of media literacy and emergent forms of storytelling around user created content (UCC). During my research I explored the rise of the politics of personalization — a concept informed at the level of the local, social and individual. I argue that in the shift from 20th century packaged media to 21st century conversation media we have witnessed a tension between ‘personalization’ as a notion deployed by industry (i.e. ‘personal technologies’) and how this has been interpreted, challenged and redefined by user. This tension between trickle-down (industry) and bubble-up (user) models of media is particularly apparent within UCC. My case studies of UCC in four locations (Tokyo, Seoul, Hong Kong and Melbourne) over an eight-year period has attempted to grasp some of the ambiguities around UCC and the attendant labor practices (i.e. emotional, social, affective and creative) I call ‘imaging communities’ or what Jean Burgess (2008) calls ‘vernacular creativity’.

In my recent research into ‘online communities’ in the region (case studies Tokyo, Shanghai, Seoul, Singapore, Manila and Melbourne) I have become increasingly interested in media literacy focus on cross-generations. My research has destabilized confluences around new media, digital natives and youth. In my preliminary studies in Manila and Shanghai many of my young adult respondents complained about their parents’ ‘excessive’ use of social networking systems (SNS) and online games with one Chinese female respondent aged 20 noting, ‘I worry my father is addicted to online games. Their generation has too time on their hands, we don’t have the time to get addicted!’ And then there is the issue of whether to befriend your mother or father on facebook...

Research challenges that the DN phenomenon poses for your area of interest

Following on from my discussion above of cross-generational media practice (particularly around social networking systems), I believe there needs to be more work exploring these cross-cultural and cross-generation forms of media literacy to challenge confluences around youth and DN. Given that much of the current literature on SNS (i.e. danah boyd) has focused upon Anglophonic youth cultures, I think we need to work on broadening the research questions to acknowledge that actually a lot of ‘non-youth’ (or perhaps ‘kidadults’) are using SNS as much, if not more, than the so-called youth DNs.

Publication that best represents the vector of principal research interests.

- (2009) *Mobile Media in the Asia-Pacific: Gender and the Art of being Mobile*: mobile technologies and gender in the Asia-Pacific region (London: Routledge).
- Larissa Hjorth (2009) ‘The price of being mobile: youth, gender and mobile media’, in Stephanie Donald, Theresa Anderson and Damien Spry (eds) *Youth, Society and Mobile Media in Asia* (London/New York: Routledge).



Todd HOLDEN is Professor of Mediated Sociology in the Graduate School of International Cultural Studies at Tohoku University, in Sendai, Japan. His writings embrace Japanese society, social theory, digital youth, semiology, advertising, television, sports, globalization, gender, identity, nationalism, cultural and political communication, and comparative culture. Books include *medi@sia: media/tion in and out of context* (Routledge, 2006), *Globalization, Culture and Inequality in Asia*

(Trans Pacific Press, 2003) and *Reading Signs: Language, Culture and Society* (in Japanese, Tohoku University Press, 2000). Recent chapters have addressed: Japanese adolescent cell phone use; Japanese Internet dating, conceptions of heroes in Japanese culture; masculinities in Japanese TV food shows; theorizing sports globalization, and televisual nationalism in the 2006 Olympics. Three working manuscripts include: *Sportsports: theorizing Japan's globalization via sport import and export*; *Telebi Nippon: engineering emotions, manufacturing unity, cultivating identity*; and *Ukiyo-ad: inside the floating world of Japanese TV advertising*. Todd publishes a regular column on Japanese popular culture called *ReDotPop*, as well as a Travelblog, *Peripatetic Postcards*, for the e-zine PopMatters. holden@intcul.tohoku.ac.jp
<http://www.intcul.tohoku.ac.jp/~holden/>
Blog: <http://www.popmatters.com/pm/blogs/peripateticpostcards>

How the DN theme intercepts with primary research interests:

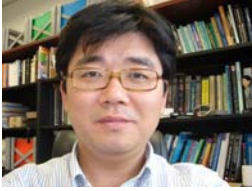
My primary concerns center on digital identities – particularly as manifested by youth – and the social consequences of shifting or mutable identities. Beyond forms and strategies of identity creation and communication, I am interested in the ways the technologies facilitate this process. Insofar as the DN Workshop emphasizes two areas of comparison – the difference between digital natives and the preceding generation, on the one hand, and the shared similarities among DN across societies, on the other – I am interested in bringing the identity questions to these comparative dimensions. In particular, I am curious to see how strategies of multiplicity and mutability are processed between generations, and also within the same generation across the globe. In each case, I am curious about practices, outcomes and the implications for our collective future.

Research challenges that the DN phenomenon poses for your area of interest

Pragmatically, the kinds of concern I have are similar to that experienced by many comparative social researchers: the nature of the topic described above requires researchers capable of studying a phenomenon in multiple languages. Normatively, one challenge rests with how society treats the research results. The idea that identities are mutable and multiple has historically been viewed in many cultures as either undesirable (in psychology) or, at least, inauthentic (in the case of civil society, but also the law). Derivatively, instrumentalities and social processes that abet this behavior have tended to be derogated, if not scorned. In a new digital world, with ascendant DN values at the core, it may be the case that the mechanisms and practices that enable multiple identifications are no longer viewed as illegitimate. One offshoot is that mechanisms to assist multiplication – such as laws concerning privacy -- may undergo change. In this way, these normative-cum-socio-political concerns provide a less standard way of looking at “divide” that researchers and policy-makers will be challenged to consider.

Publication that best represents the vector of principal research interests.

“The Social Life of Japan's Adolescence,” in P. Nilan and C. Feixa (eds.), *Global Youth? Hybrid Identities: Plural Worlds*. Abingdon, Oxon: Routledge (2006), pp. 72-90.



Yong JEONG is an associate Professor of Department of Bio and Brain Engineering at KAIST. Dr. Jeong received his M.D degree in 1991 and Ph.D in neurophysiology in 1997 at Yonsei University. His research fields are Cognitive Neuroscience, Clinical Neurology (degenerative disease, vascular disease), Functional Neuroimaging, and Bioengineering (biosignals). His interest is the fundamental architecture of cognitive function and with this he wants to develop restoration, augmentation and modulation systems for patients with brain dysfunctions using bioengineering techniques. He is also a Neurologist and affiliated with Samsung Medical Center. yong@kaist.ac.kr

How the DN theme intercepts with primary research interests:

Dealing with college students for several years and raising two kids (13 and 8 year old each), I've come to notice the difference in their ways of thinking. The difference in ways of thinking means differences in cognitive process, and cognitive differences may mean the structural differences in their brain. Cognitive processing in the brain is dependent not only on the genetic background but also on the environment or experience one has. Since the IT revolution has brought changes the prior generation has never witnessed, the kids today have completely different experiences from the ones their predecessors (digital immigrants) had. If there are differences in cognitive processing, to examine how different they are and whether the cognitive differences correlate the differences in their brain structure, using the methods of brain imaging, intercepts with my main research interests, which include cognitive neuroscience and neuropsychology. The differences may be of a domain specific way, rather than a global one, when considering the way the brain actually works. Here, an interesting question can be raised: Which domains or modules of the brain function are being influenced by the digital environments?

Research challenges that the DN phenomenon poses for your area of interest

Among the DN phenomena, such cognitive features as twitch speed, short attention span, parallel processing, random access, sensitivity to graphics rather than texts of the DN kids are the topic of my interest. These cognitive features are tightly related to major cognitive functions such as attention and frontal executive function. To examine how these functions of the DN kids are different, psychometrics will be used to see the differences from a neuropsychological point of view and also imaging techniques to see the structural and functional differences in their brain. Longitudinal studies can provide more direct evidence of changes.

Publication that best represents the vector of principal research interests.

Following article is an example of my researches that characterize the patients with Alzheimer's disease. However, similar approaches can be used to conduct the fore-mentioned DN researches.

Kim EJ, Cho SS, Jeong Y, Park KC, Kang SJ, Kang E, Kim SE, Lee KH, Na DL. Glucose metabolism in early onset versus late onset Alzheimer's disease: an SPM analysis of 120 patients. Brain. 2005 128(8):1790-1801.



Roland Nozomu KELTS is the half-Japanese American author of *Japanamerica: How Japanese Pop Culture has Invaded the US* (www.japanamericabook.com), published by **Palgrave**

Macmillan in the U.S. and Europe, and in Japanese by **Random House Kodansha**. He is also a professor at **The University of Tokyo**, **Sophia University** and **The University of the Sacred Heart Tokyo**, a contributing writer and editor for **A Public Space** and **Adbusters** magazines, and a columnist for **The Daily Yomiuri**. He is the editor in chief of **Anime Masterpieces**, a U.S.-based anime lecture and screening series, and his writing appears in numerous publications in both the U.S. and Japan. He has been a featured speaker at numerous venues in the US, Japan and UK, including the Museum of Fine Arts Boston, The Smithsonian Museum, the University of California, Berkeley and the Massachusetts Institute of Technology. Last summer he delivered a paper on Digital Isolation at the “Digital Youth Asia” conference at Temple University Japan. Kelts’s forthcoming novel is called **ACCESS**, due out next year. He divides his time between New York and Tokyo. RKELTS@gmail.com

How the DN theme intercepts with primary research interests:

My most recent research and writing has focused upon the concept of digital displacement—a reorientation of temporal and geographical boundaries vis-à-vis digital media, especially among the atomized, youthful mobile masses in contemporary Japanese cities. The Digital Natives construct affords me fresh ways of pursuing this expanding tableau with respect to generational paradigms.

Research challenges that the DN phenomenon poses for your area of interest

Clearly, it’s difficult to delineate what makes a ‘generation’ in the 21st century. Some young people are tech-savvy, others are not. Urban and rural boundaries are no longer applicable. Some over-40s are quicker on Twitter than their children. We need a more expansive scope.

Publication that best represents the vector of principal research interests.

My latest essay on Japan’s digital masses, “Japan’s Private Worlds,” is just out in the latest issue of *Adbusters* magazine, #86, now on newsstands and soon to be online. My paper entitled “Autistic Japan: Mobile Communications vs. Making Contact” was delivered at Temple University Japan last summer, and will be published in *Wired* magazine this coming winter.



Gregor KENNEDY is a Senior Research Fellow in Educational Technology and Informatics in the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne. He has been researching in education and educational technology for over 15 years. He has recently led a number of large-scale, empirical investigations of “Net Generation” students now entering University and these have provided significant insight into how students use technology and emerging technology based-tools in higher education. Dr Kennedy has also developed strong programs of research in human-computer interaction, cognition and interactivity and the use of electronic log files in educational technology research. Dr Kennedy has considerable experience in the design, development, implementation and evaluation of educational technologies. He is an accomplished educational designer and has been awarded numerous learning and teaching grants that have facilitated the development and application of educational technologies to enhance students’ learning processes and outcomes in higher education settings. Dr Kennedy has published widely in the area of educational technology and student learning, and has been an invited speaker in a number of national and international forums. He most enjoys working with

his doctoral students and learning from his two children aged two and four.
gek@unimelb.edu.au

How the DN theme intercepts with primary research interests:

As an educational technology researcher, I have been investigating the Digital Natives and Digital Immigrants area since 2006. I have carried out a number of investigations on students' perceptions of, experiences with, and expectations for technology in the context of higher education. I have also considered how emerging, Web 2.0 technologies can be usefully employed in university-based educational settings.

Research challenges that the DN phenomenon poses for your area of interest

There are considerable challenges in countering the rhetoric about the Net Generation or the Digital Natives in both the educational and the broader community. There is a common-sense appeal about the construct of the 'Digital Native' that, in part, makes it resistant to empirical evidence about the characteristics of current university students.

A challenge for researchers is moving beyond the simple notions and dichotomies of Natives/Immigrants to consider, with more sophistication, the inevitably complex relationships between young people, technology, culture and learning.

Publication that best represents the vector of principal research interests.

Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K. (2008). **First year students' experiences with technology: Are they really digital natives?** *Australasian Journal of Educational Technology*, 24(1), 108-122.



Yong Se KIM is the Director of the Creative Design Institute and a Professor of Mechanical Engineering at Sungkyunkwan University, Korea. The Creative Design Institute is an interdisciplinary design research and education group composed of design foundation, design social sciences and design informatics teams with 12 faculty members and 6 full time researchers as well as graduate and undergraduate students (<http://cdi.skku.edu>). Professor Kim also directs research efforts on personalized learning supports for creative design reasoning. He is a co-chair of the Design Creativity special interest group of the Design Society. He is the Principal Investigator of the Product-Service Systems Design project sponsored by the Korean Ministry of Knowledge Economy. He also leads the Service Design special interest group of the Service Sciences National Forum of Korea.

Yong Se Kim has received his PhD in Mechanical Engineering with minor in Computer Science at the Design Division of Stanford University in 1990. His MS degree is also from the Design Division of Stanford University. His undergraduate study was done at Seoul National University, Korea. From 1990 to 1997, Yong Se Kim was an Assistant Professor at the University of Illinois at Urbana-Champaign; from 1997 to 2000, an Associate Professor at the University of Wisconsin-Milwaukee. He joined Sungkyunkwan University in 2000. yskim@skku.edu <http://cdi.skku.edu>



Ji-Hyun LEE is an Associate Professor of the Graduate School of Culture Technology at KAIST. She also received a joint appointment as

a professor of Knowledge Service Engineering and KI for Entertainment Engineering. Before joining KAIST, she was an Assistant Professor of the Department of Digital Media Design and Graduate School of Computational Design at National Yunlin University of Science & Technology (NYUST) from 2002-2007. She received her Ph.D. from the School of Architecture (Computational Design) at Carnegie Mellon University in 2002. Her research interests are the artificial intelligence in design (representation & reasoning), color, computation and culture, design creativity (computation and cognitive models), expert systems (generative and evolutionary design systems), formal modeling of design process and visualization for design information. Currently, she serves for the secretary of Computer-Aided Architectural Design Research in Asia (CAADRIA), program committee of ASME Asia-Pacific Engineering Education Congress (APEEC), director of Korea Society of Design Science (KSDS), editor of Society of CAD/CAM Engineers and operation committee of Service Design SIG of SSNF. She is also a member of AIK, KHCI and KIIS. jihyunlee@kaist.ac.kr



Soo-Young LEE received Ph.D. degrees from Seoul National University in 1975, Korea Advanced Institute of Science in 1977, and Polytechnic Institute of New York in 1984, respectively. From 1977 to 1980 he worked for the Taihan Engineering Co., Seoul, Korea. From 1982 to 1985 he also worked for General Physics Corporation at Columbia, MD, USA. In early 1986 he joined the Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, as an Assistant Professor and now is a Full Professor. at

the Department of BioSystems and also Department of Electrical Engineering and Computer Science In 1997 he established Brain Science Research Center, which is the main research organization for the Korean Brain Neuroinformatics Research Program from 1998 to 2008 with about 35 Ph.D. researchers from many Korean universities. He is a Past-President of Asia-Pacific Neural Network Assembly. He received Leadership Award and Presidential Award from International Neural Network Society in 1994 & 2001, and the APPNA (Asia-Pacific Neural Network Assembly) Service Award in 2004 His research interests have resided in artificial brain, the human-like intelligent Systems based on biological information processing mechanism in our brain. He has worked on mathematical models of perception, inference, emotion, and behavior, including auditory sound localization and speech enhancement, the unsupervised pro-active developmental models of human emotion and knowledge with multi-modal man-machine interactions, and the top-down selective attention for superimposed and/or multimodal pattern recognitions. Especially, he is interested in combining computational neuroscience and information theory, of which example is Independent Component Analysis for blind signal separation and feature extraction. Also, he had recently extended his research into Artificial Cognitive Systems with higher cognitive functions such as proactive knowledge development, unknown situation awareness, and social cognition. Multimodal brain-signal measurements are also studied for the higher cognitive functions and brain-computer interfaces. sylee@kaist.ac.kr

Terence LYONS is a Program Manager at the Air Force Office of Scientific Research (AFOSR) managing a research portfolio in Socio-Cultural Modeling. With a staff of 142 scientists, engineers and administrative personnel, and a \$300 million budget, the AFOSR maintains the technological superiority of the U.S. Air Force. This office selects, sponsors and manages research relevant to Air Force needs in science and technology, and is the single manager for the entire Air Force basic research program. The AFOSR reports to the Air Force Research Laboratory (AFRL) with headquarters at Wright-Patterson AFB, OH

Dr. Lyons began his Air Force career in 1976 as a Medical Officer. In his last Air Force assignment Dr. Lyons was the Commander/Deputy Director of the Armstrong Laboratory, Air Force Materiel Command. In that job he exercised oversight authority for over 2,150 military, civilian and contractor personnel, with an annual budget of \$225 million and \$240 million in special purpose facilities. From 1997 until 2000, as an Associate Clinical Professor at Wright State University School of Medicine, Dr. Lyons was assigned under an Intergovernmental Personnel Agreement (IPA) to be a Liaison Officer covering the area of life sciences and chemistry at the Asian Office of Aerospace Research and Development (AOARD) in Tokyo, Japan - an overseas detachment of AFOSR. From 2001 to 2006 he was the Director of the Asian Office of AOARD leading a staff of liaison scientists, administrative officers, and visiting scientists dedicated to assessing emerging technologies and encouraging interaction between AF scientists and research communities in Asia and the Pacific Rim working on leading edge technologies. From 2006 to 2007 Dr. Lyons was the Deputy Chief Scientist of AFOSR advising the Director in planning and integration of AF basic research programs. Dr. Lyons is a Fellow of the American College of Preventive Medicine and the Aerospace Medical Association. He is board certified by the American Board of Preventive Medicine in both Aerospace Medicine and Occupational Medicine. He has served as a member of the Advisory Editorial Board of Aviation, Space and Environmental Medicine and has published over 40 peer-reviewed scientific articles, as well as numerous other presentations and publications. From 1995-1997, he was appointed by the Deputy Assistant Secretary of Defense to be the U.S. National Coordinator for the AGARD (NATO) Aerospace Medicine Panel (AMP).

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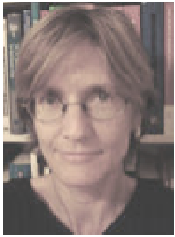


How the DN theme intercepts with primary research interests: I am a Program Manager at AFOSR in Arlington, Virginia managing a basic research portfolio in Socio-Cultural Modeling. AFOSR selects, sponsors and manages basic research relevant to Air Force needs in science and technology, and is the single manager for the entire Air Force basic research program. The AFOSR reports to the AF Research Laboratory with headquarters at Wright-Patterson AFB, Ohio. Our goal is to build collaborations between AFRL and universities.

Research challenges that the DN phenomenon poses for your area of interest: We are interested in developing a basic research foundation for using computational and modeling approaches to study behavior of group and communities. This program seeks fundamental understanding of the interactions between demographic groups both to create understanding for technology developments for enhanced cooperation, such as operational decision making with coalition partners, and to explain and predict outcomes between competing factions within geographic regions. This program encourages collaboration between social, behavioral, cognitive, and biological scientists with

computational researchers in disciplines such as mathematics, computer science, modeling, AI, control theory, and adaptive systems.

Vector of principal research interests. Broad Agency Announcement (BAA) is open at all times to innovative ideas <http://www.wpafb.af.mil/AFRL/afosr/>



Mary Lou MAHER is developing an emphasis on research in creativity in CISE (CreativeIT). She joined the Human Centered Computing Cluster in CISE in July 2006. She is the Professor of Design Computing and the Co-Director of the Key Centre of Design Computing and Cognition at the University of Sydney. She received her BS (1979) in Civil Engineering at Columbia University and her MS (1981) and PhD (1984) in Civil Engineering at Carnegie Mellon University. She was an Associate Professor at Carnegie Mellon University before joining the University of Sydney in 1990. She has held joint appointments in the Faculty of Architecture and the School of Information Technologies at the University of Sydney. She is a researcher in NICTA (National Information and Communication Technologies Australia) and a member of the Research Committee in the Collaborative Research Centre for Construction Innovation in Australia. Her current research interests include intelligent rooms, adaptive agents in design environments, motivated learning in physical and virtual worlds, tangible user interfaces for 3D design, empirical studies and new technologies for computer-supported collaborative design, and generative design systems in 3D virtual worlds. mmaher@nsf.go

How the DN theme intercepts with primary research interests: Various interaction techniques have an impact on our way of thinking and our way of interacting with others. My research interests include the development of new environments for designing and design collaboration, such as collaborative virtual worlds and tangible interaction on tabletop systems. In my research, I develop new technologies that are particularly suitable for design and focus on how these environments encourage the cognitive processes that are typically associated with creativity

Research challenges that the DN phenomenon poses for your area of interest

Research challenge 1: What is the impact of current and future digital technologies on our cognitive processes? Can we design future technologies that encourage creativity?

Research challenge 2: How will we design in the future when collective intelligence is an alternative to the single designer or well formed design team?

Publication that best represents the vector of principal research interests.

Kim, M. J. and Maher, M.L. (2008). The Impact of Tangible User Interfaces on Designers' Spatial Cognition, *Human-Computer Interaction A Journal of Theoretical, Empirical, and Methodological Issues of User Science and of System Design*, Volume 23 Issue 2, 101-137. <http://dx.doi.org/10.1080/07370020802016415>



Janet E. Miller, PhD, joined the United States Air Force (USAF) 711th Human Performance Wing (HPW), Human Effectiveness Directorate, Wright-Patterson Air Force Base, Ohio, USA, as a Senior Electronics Engineer in February 2002. Her research areas include trust in the cyber domain, human-systems integration, macrocognition, and visualization for complex, analytic technologies. Of these fields, the majority of her time is being spent on development of a research roadmap for the

Human Effectiveness Directorate for trust in the cyber domain, a project which brings together her experience in information technology with her knowledge of cognitive engineering. Topics of interest being incorporated are Trust Measurement, Trust Manipulation, and Cultural and Social Networking Analysis. Additionally, she has co-edited a book entitled "Macrocognitive Metrics & Complex Scenarios for Design and Evaluation." Prior to coming to the 711th HPW, Dr. Miller was an Information Systems Engineer for the USAF. Janet earned her Ph.D. in industrial and systems engineering from The Ohio State University, Columbus, OH, in 2002; her M.S. in management information systems from The University of Arizona, Tucson, AZ, her M. A. in economics from the University of Oklahoma, and her B. S. in electrical engineering from Louisiana Technical University, Ruston, LA. She is a member of the Association of Computing Machinery, the Institute of Industrial Engineers and the Human Factors and Ergonomics Society. Janet.miller3@wpafb.af.mil

How the DN theme intercepts with primary research interests: I'm currently involved in Trust in Automation. However, there are generational/experience differences which must be identified and addressed to understand how to develop systems where the users have appropriate, calibrated trust. Do digital immigrants trust too little? Do they have a better understanding of the real world to know how the digital world relates? Do digital natives trust too much? What are their methods of determining what's real and what's altered? These are some of the myriad of questions which must be considered to develop systems of the future.

Research challenges that the DN phenomenon poses for your area of interest:

1. **Comparative trust for decision support tools:** How can we objectively measure the comparative trustworthiness of alternative tools available to Air Force personnel who are required to "fight through" despite compromised capabilities in the digital realm?
2. **Risk model:** How do you synthesize the individual components and their digital trust levels so that areas can be mitigated to build the best decision?
3. **Social trust:** Can we develop a better ability to measure and calibrate digital trust in human-human relationships, mediated or unmediated by computer systems?
4. **Trust predisposition:** How can we predict and measure the pre-dispositional level of individual user digital trust?
5. **Synthesize:** How do we synthesize digital trust judgments from multiple systems and across multiple layers to improve decision making and support common ground?
6. **Digital trust:** How do you maintain trust and cooperation in teams when they are working through a technological intermediary?
7. **Individual differences:** How do individual differences such as experience, personality, emotional, state, etc., influence digital trust?

Publication that best represents the vector of principal research interests. I have just begun working in the area of trust in automation, so don't have an accepted publication in a referred journal. However, *The Dynamics of Trust in Cyberdomains* with co-authors Robert Hoffman/IHMC, John Lee/University of Wisconsin, David Woods/The Ohio State University and Nigel Shabolt/University of Southampton has been pre-selected for publication in IEEE Intelligent Systems.



Reynold REDEKOPP is a professor in the Faculty of Education at the University of Manitoba. He has been a leader in Manitoba in terms of helping to develop the skill sets of students and teachers with the use of technology. He is the current president of the Manitoba Association for Computing Educators (ManACE) and the coordinator of the summer technology workshops for teachers. For the past three years, he has been the coordinator of the Girls in Gaming Program to increase the female voice in the development and creation of video games. Dr. Redekopp has 29 years of experience teaching and using technology at the junior high, high school and university levels and his current research interests are in using technology to raise the activity profile of the silent and/or reluctant student. rredekopp@gmail.com

How the DN theme intercepts with primary research interests:

My research interests are in the abilities of new technologies to give a voice to the previously quiet/reluctant student and in meeting the learning needs and styles of a variety of DN learners.

Teachers need substantive research on how new technology can build positive learning experiences for all their students before they will adopt it.

Research challenges that the DN phenomenon poses for your area of interest The rapid change of web 2.0 resources and what DN are 'into' at given moment.

Identifying how all learners can best benefit from DN characteristics/attributes

Finding useful metaphors to describe and explain how DN are different and how they influence the world

Changing teacher attitudes as to how education can/should be done.

Publication that best represents the vector of principal research interests.

Redekopp, R., & Bourbonniere, E. (2009). Giving Reluctant Students a Voice. *Learning & Leading with Technology*, 36(7), 34-35.



Dave SONNTAG, PhD, is Deputy Director of the Asian Office of Aerospace R&D (AOARD), in Tokyo, Japan. He is a Lt Col in the US Air Force, and has been a bioenvironmental engineer since receiving his commission in 1991. He is described by friends and co-workers as a polymath, with broad interests and abilities ranging from music to science. Prior to his current assignment in Tokyo, he was stationed for four years in the National Capital Region, during which he spent six months working in the Pentagon as a senior science & technology advisor to four deputy undersecretaries of defense. He obtained his PhD in toxicology, from the University of Cincinnati in 2004, under Air Force sponsorship, and was formerly Director of Research Operations for the Operational Toxicology Branch of the Air Force Research Laboratory, in Wright-Patterson AFB, Ohio. Prior to that, he was stationed at Hill Air Force Base,

Utah, where he was responsible for environmental health and safety programs at a large Air Logistics Center, with multiple industrial & hazardous waste problems. Before obtaining his Masters in Public Health in 1991, and BS in Molecular Biology in 1986 from the University of Utah, he worked in health care informatics, environmental consulting, as an operating room technician, in mosquito abatement programs, and public vaccination campaigns in the Dominican Republic & Peru. aoard.lifesci@gmail.com

How the DN theme intercepts with primary research interests:

It's been interesting to watch the differences in how my older kids have interacted with technology, compared to the younger ones. I'm impressed, maybe dismayed, at how much multi-tasking the younger ones do. I'm concerned about how this impacts socialization, and time that otherwise would be spent on developing specific skills and talents. Mastery of a musical instrument is something that requires about 10,000 hours of concerted practice and focused attention. The same could be said for becoming a skilled fighter pilot, martial artist, or just about any other old-school skill. With the use of software-assisted, user-generated content, however, I can understand why they see no need to acquire skills that formerly required drill-and-kill repetition. So how to educate DN's is a big challenge. Digital distraction is a real concern--I am concerned that they lack the ability to perform tasks that require sustained vigilance. Two other areas that I see undergoing rapid sociocultural evolution for Digital Natives are their approach to spirituality, and sexuality. All of these areas will definitely spill over into how I lead and mentor my own kids, as well as those entering active duty service in the military.

Research challenges that the DN phenomenon poses for your area of interest I

think the multi-disciplinary nature of the research is the biggest challenge. I see this as an extension of much of the work AFOSR has previously supported under sociocultural modeling & prediction initiatives. Understanding complex adaptive systems as they apply to understanding emergent and collective behavior is one promising avenue of inquiry.

Publication that best represents the vector of principal research interests. I have no publications in this area.



Von-Wun SOO was born in Kaohsiung and graduated from EE department of National Taiwan University in 1976. After he got his Ph. D. in Computer Science from Rutgers University in 1987, he joined Department of Computer Science of Tsing Hua University, Taiwan in 1988. He had served as president of Taiwanese Association for Artificial Intelligence in 1997-1998. In 2004, he was invited and appointed a secondment position as Professor and Dean of Research and Development at National University of Kaohsiung. After four years of service, he was promoted as Vice president of Academic Affairs at National University of Kaohsiung. His research interests cover many fields in artificial intelligence such as machine learning, natural language acquisition, intelligent agents and bioinformatics. Recently, he has been working on an NSC research project on generating stories in interactive drama using believable agents with emotion and social cognition, an e-learning project on automatically recommending teaching activities based on negotiation, and a bioinformatic project in collaboration with physicians in Chang-Gang Hospital on integrating gene expressions and functional networks to explain the drug effects in Choriocarcinoma and Ovarian cancer. During his academic career up to now, he has published more than 150 papers. soo@cs.nthu.edu.tw

How the DN theme intercepts with primary research interests:

We are working on the technologies for developing virtual agents that will be able to produce narrative in interactive drama for future entertainment and educational games. Digital native's behaviors as role playing in the interactive games will affect development of the narratives. We are also interested in understanding the social and cultural differences and tendencies of digital natives/immigrants that might affect the outcomes of the interactive games.

Research challenges that the DN phenomenon poses for your area of interest :

How to recognize and differentiate the cultural background and social status and emotional states from digital natives in interactive games for virtual agents in producing properly response and actions in the interactive games?

Publication that best represents the vector of principal research interests.

Hsueh-Min Chang and Von-Wun Soo, Simulation-Based Story Generation with a Theory of Mind, Artificial Intelligence and Interactive Digital Entertainment Conference, AIIDE 2008.



Damien SPRY is a researcher and consultant on youth and children's media, particularly mobile media and public policy in Australia and Japan. His work looks at young media users ("Generation 'Y' / the 'digital generation') and the policy making process. At the University of Sydney, Damien's research forms part of 'Mobile Me: Youth Sociality and Mobile Phones' – an Australian Research Council project by the University of Sydney and the New South Wales Commission for Children and Young People, and undertakes research for private bodies in Germany and the United States.

He has presented at academic and industry events in Australia, Japan, the United States and Germany. He is a member of the Editorial Board of *Communications Theory*, a journal of the International Communications Association. He is the Online Editor of *Sydney Ideas Quarterly* – a journal of the University of Sydney and coordinates the Sydney Asialink Leaders Program for the University of Sydney and presents on Japan, digital media and pop culture in that program. He teaches in politics, sociology and communications at the University of Sydney and the University of Technology, Sydney. Damien.Spry@uts.edu.au

How the DN theme intercepts with primary research interests: My main area of research is on the uses of mobile media by children and young people in Australia and Japan, with a particular focus on the political discourses associated with youth mobile media use and consequences of such discourses. The theme of digital natives, and the optimistic generationalism it suggests, is one of the ways contemporary mediated childhood/youth is framed within such political discourses. It is also being directly invoked by pioneering educational institutions in Australia when introducing, often contentiously, new media into their classrooms and curricula. It is contrasted, in these debates, with similarly essentialist notions about the (developmental, cultural, physical and legal) risks that new media pose for – and by – children and young people. The representations of media and of children in these debates are a primary interests of mine.

I also am engaged in research and teaching in children's media more generally, Japanese pop culture – primarily manga and anime – and, broadly, political theory, Asian studies and media studies.

Research challenges that the DN phenomenon poses for your area of interest

There are a number of significant research challenges. Methodologically, it is difficult to acquire recent data on media use by children and young people, partially due the ethical restrictions and resource intensity of doing research with minors, partially due to shifting landscape of multimedia uses. (This is also, of course, something that makes this area of research so compelling.) Analytically, the tensions between, on one hand, developmental psychological approaches to psychosocial impact assessment and, on the other hand, media effects traditions within media studies, often lead to contrasting approaches that are difficult to reconcile. The tend to generalize about DN globally is also a concern.

Publication that best represents the vector of principal research interests.

Spry, D. 2007, 'Mobile information communications technology: impact on young people' in F. Papandrea and M. Armstrong (eds) Record of the communications and policy research forum 2007. Sydney: Network Insight.

[www.networkinsight.org/verve/ resources/CPRF07record.pdf](http://www.networkinsight.org/verve/resources/CPRF07record.pdf)



Toshie TAKAHASHI, PhD is Associate Professor in the Department of Communication and Media Studies, Rikkyo University, in Tokyo. She graduated with a PhD in Media and Communications from the London School of Economics and Political Science and an MA in Sociology from the University of Tokyo. A media ethnographer, her writings have been included in both Japanese and International Media Studies anthologies, for example, *Audience Studies: A Japanese Perspective* (2009, Routledge), the journal *New Media and Society* (in press, Sage), *International Handbook of Children, Media and Culture* (K.

Drotner and S. Livingstone eds., 2008, Sage), the journal *Global Media and Communication* (2008, Sage), *Medya Komyunikeishon Ron* [Media Communication Theory] (T. Takeuchi, K. Kozima and Y. Hashimoto eds., 2005, Hokuju), and *Shakai Johogaku Handobukku* [The Handbook on Socio-information studies] (S. Yoshimi and T. Hanada eds., 2004, University of Tokyo Press). Her current research is an ethnography on comparative research on digital natives funded by Grants-in-Aid for Scientific Research (Ministry of Education, Culture, Sports, Science and Technology). She recently has been invited to talk about "Digital Natives" at the University of Oxford and Nagoya University and interviewed by CNN.com. t-takahashi@rikkyo.ac.jp

How the DN theme intercepts with primary research interests:

The definition of DN. Who are DN? Age? Experience? What is the main digital technology to define the DN experience? Internet? Game? (tamagocchi? Nintendo?) SNS? *Keitai* (Mobile Phone)? Should they have to have those digital media since they were born? Or it is OK for them to have them, say since they were 12 years old?

Research challenges that the DN phenomenon poses for your area of interest

3 screens strategies: How DN engage with three screens, ie. Mobile phone, PC and TV?

Publication that best represents the vector of principal research interests.

Takahashi, T. (2009) *Audience Studies: A Japanese Perspective*. London and NY: Routledge.

Takahashi, T. (in press) MySpace or Mixi? Japanese Engagement with SNS (Social Networking Sites) in the Global Age. *New Media and Society*.



David WORTLEY is Director of the Serious Games Institute (SGI) at Coventry University. He is responsible for the development of the Institute as a brand new self-financing initiative to establish a centre of excellence for the emerging serious games application area. Working with academics, regional development agencies and leading computer games companies, David aims to make the SGI a thought leader and focal point for games based learning, simulation and immersive 3D virtual environments. David's career began with a university scholarship from Post Office Telecommunications and has embraced the converging and emerging technologies of telecommunications, computing (IBM), digital media (Mass Mitec) and the creative industries (De Montfort University). He is a serial entrepreneur and innovator with a passion for applying technology to social and economic development. dwortley@cad.coventry.ac.uk

How the DN theme intercepts with primary research interests:

Digital Natives pose fresh challenges to the education and training of all age groups from primary education through secondary and tertiary education to vocational training and lifelong learning. In particular the changes in multi-tasking capabilities and preferred learning styles of future generations, coupled with ready on-line access to rich forms of information and knowledge means that traditional classroom hierarchical models of learning based on knowledge transfer need to be replaced by facilitated learning supported by technology assisted applications such as serious games.

I am interested in debating and understanding how academia, industry and society can best respond to these challenges.

Research challenges that the DN phenomenon poses for your area of interest

What games-based learning technologies and methodologies are likely to be most effective and how can this best inform learning and development strategies.

Publication that best represents the vector of principal research interests.

The Learning Magazine Spring 2009 contains an article that is close to my principal research interests :-

<http://content.yudu.com/A18tIs/LMSum09N/resources/index.htm?referrerUrl=http%3A%2F%2Flogin.yudu.com%2FYudu%2FmanageBookStaging.htm%3FnodeId%3D2091232>



Alvin W. YEO earned his PhD and Bachelor of Computing and Mathematical Sciences (Hons) from the Computer Science Department, University of Waikato, New Zealand. He is currently an Associate Professor at the Faculty and the Director, Centre of Excellence for Rural Informatics. He also heads the Sarawak Language Technology (SaLT) Research Group which covers the preservation of indigenous languages through ICTs.

Alvin has expertise in the area of Information Systems, specifically in Information and Communications Technology for Rural Development (ICT4RD) and human computer interaction (HCI). His ICT4RD research has resulted in over 10 publications, including 3 book chapters in The Encyclopaedia of Developing Regional Communities with ICT. In recognition of his expertise, Alvin has been involved in the evaluation of a Federal Government ICT4RD programme (study was commissioned by the Malaysian Communication and Multimedia Commission). In addition, Alvin co-produced A Guidebook on Setting Up Community E-Centres in Rural Areas Based on the Experiences in Malaysia commissioned by UNESCAP. In addition to ICT4RD research, Alvin is also active in HCI research, specifically in software internationalization, multimodal interaction, and universal accessibility. In these areas, he has authored/co-authored over 30 papers. He was Chair for the International Cyberspace Conference on Ergonomics (CybErg) in 2008, CITA 2009, and has edited 4 conference proceedings. Alvin has completed 8 research projects, and currently involved in 10 on-going projects (total value of projects approx. USD 3 million). These projects include collaboration with international researchers. alvin@fit.unimas.my

How the DN theme intercepts with primary research interests:

My two primary areas of research are ICTs for rural development (ICT4RD) and Cultural impact on human computer interaction (CioHCI):

In ICT4RD, there are predominantly no DNs in the rural areas, whereby in some cases, they do not have access to power or telephones.

In CioHCI, DNs are a totally new group of users whom the software developers need to consider, and accommodate.

Research challenges that the DN phenomenon poses for your area of interest

ICT4RD: The digital divide is widening, with DNs mainly from the urban areas, and non-DNs from the rural areas. How do we bridge this ever widening gap? Then again, do we want the rural children to become like the DNs?

CioHCI: Are DNs in one country the same as those in other countries? Development of interfaces and software would be targeted at DNs as one group, i.e. blurring of the international boundaries?

Publication that best represents the vector of principal research interests.

Yeo, A. W., Azman B. M., Ong, S.C., Songan, P., Gnaniah, J, Khairuddin A.H., and Bala, P. 2006. *Lessons Learnt in the Development of Applications for Remote Communities*. Localisation Focus – The International Journal of Localisation. Vol. 5. No. 1. p5-11.

GRAD STUDENT ASSISTANTS:



Andrea BIANCHI received a Laurea (2004) in Business and Administration from Università Commerciale L. Bocconi in Milano, Italy, and a M.S. in Computer Science (2007) from New York University. After having spent a year as a game developer at Rebel Monkey, a New York based computer-game company, he moved to South Korea where he is working on his Ph.D. in Culture Technology at KAIST (Korean Advanced Institute of Science and Technology). His main interest is an interdisciplinary branch of Human Computer Interaction (HCI), more specifically about Haptic Security Interfaces and how they are used in an Ubiquitous Computing environment. For information about Andrea's research and a full profile you can check out the page <http://andreabianchi.alsoplantsfly.com>

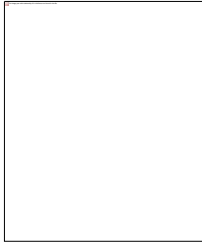


Jumin CHI is the M.S.Candidate in Graduate School of Culture Technology at the KAIST, Korea. She is a member of Human Centered Computing Group in Social Computing Laboratory in GSCT. She received her Bachelor's degree in Art and Engineering (Industrial and Media Design Department) from the Handong University, Korea (2008). She is a member of the Ubiquitous Computing and Mobile UI Design Group in Handong University. She was a Design Team Manager of Student Government in Handong University, Korea(2005). She is interested in User eXperience design especially in Mobile and Web industry. She was accepted in UXD(User eXperience Design) Practicum in NHN Corp, and her team has been honored with the highest award(2009) topics in 'Mobile Smart Finder Design'. Also, she served internship at Samsung (2007), doing technology research and planning design strategy. She designed Next Generation UMPC (Samsung, 2007), UX Scenario and Product (Samsung, 2008), and Mobile User Interface (LG, 2005) which are academic-industrial cooperation in Samsung and LG. She is a member of Band. Baker's Ave. and A-cappella group Pitch-Pipe. Also, She has experience in voluntary service for disabled people in UK(2006). More information about her can be found on her home page: http://ucc.kaist.ac.kr/wiki/index.php/Jumin_Resume



ChangHyun KIM was born in S.Korea, in 1979. He received the B.S. degree majoring electrical engineering from the KAIST in 2002. After his undergraduate, he had worked for a wireless lan card and AP manufacturing company as a programmer for three years. After this job, he got the M.A. degree from the Stanford Univ majoring computer music in 2006 and the M.S. degree majoring electrical engineering signal processing from the University of Southern California in 2008. Currently, he is a Ph.D. student at the Department of Bio and Brain Engineering, from the KAIST. His research interests include music instrument recognition system, music/singing voice signal processing and music therapy with brain wave analysis. He is an Engineer, Pianist and Swimmer as well.

John SORMARK has received a Bachelors of Science in Biology from Arizona State University. After completing his undergraduate studies he worked a two year stint in a



Chemistry/Biochemistry laboratory before deciding to go onto his higher education. He is currently working towards a Master's Degree in Bio & Brain Engineering at KAIST. His Master's Thesis is focused of the emotional effects of the environment on the brain. Of particular importance will be the stress related affects and functional patterns on the human brain. His current research interests are EEG based studies with possible future work using fMRI imaging techniques in order to better understand the effects and function of stress on the mind.

