

ICT for Good: Opportunities, Challenges and the Way Forward

Birhanu Eshete, Andrea Mattioli, Adolfo Villafiorita, Komminist Weldemariam
Center For Information Technology
Fondazione Bruno Kessler-irst
Trento 38100, Italy
Email: (eshete,amattioli,adolfo,sisai@fbk.eu

Abstract—ICT seems well understood as a tool and an infrastructure for delivering information and services for the society and for allowing communications through interactions among the service users —mostly, the digital society. Using ICT for ensuring better life requires far more than good infrastructure, ICT know-how and the various techniques and tools in place. If ICT has to address the real problems of the society, it should be at a rescue being environment-friendly, with real and tangible impact, sustainable, seamless, down to the grass-roots and above all with reproducible experiences.

In this paper, we introduce a different perspective of looking into and using ICT, which we call ICT for Good (ICT4G). It is about using ICT for addressing problems of societies with low ICT penetration and changing a society's life for the better. More specifically, based on our observation of current promises ICT gives to society, we discuss ICT4G's distinguishing aspects, opportunities it offers, challenges it imposes along with preliminary roadmap for its realization. A high-level correlation of what we pointed out with a relevant case study (i.e., the eGIF4M¹) is presented.

Keywords—ICT4G, (digital) society, scarce resources, environment, public administration

I. INTRODUCTION

One of the most recent trends in employing ICT to support digital society is based on the use of multidisciplinary cooperation and coordination [2], [3], [4]. Several studies have witnessed its positive effects —e.g., in healthcare [5], [6], e-government and public administrations [7], [8], [9] and education [10], [11], [12], to mention few. The failure of ICT projects is also mentioned in, e.g., [13], [14], [15]

We have been involved in several society and public oriented large-scale projects (to mention some, we built an electronic voting system for the Autonomous Province of Trento [16], Interoperability project for the government of Mozambique [1]). This allowed us to discuss and work with experts from multiple disciplines (e.g., Software Engineers, Election Officials, Lawyers, sociologists) along with direct communication with the society. Such activities opened various opportunities to understand level of the existing challenges, as well as how to investigate ICT in order to provide solutions in terms of tools, techniques and methodologies at different granular levels of the society.

¹eGovernment Interoperability Framework for Mozambique [1].

In this paper, we propose a different way of looking at the benefits of ICT for society, which we call ICT for Good (ICT4G). We define ICT for Good as the use of ICT aiming at preserving and improving life through technology. Its goal is to look for problems and find solutions, which maximize the best both for the society and individuals. More specifically, it fundamentally focuses on using ICT for addressing critical society problems with low ICT penetration in a way that life is impacted for the better. By low ICT penetration, we not only refer to developing nations (where the penetration is remarkably low) but also emphasize on targeting a society suffering from significant, tangible and sustainable benefits from the penetration.

Attempting to capitalize the notion of ICT4G, we started borrowing psychological concepts to define the intuitive idea of “good” (also in [17] by Maslow) and to elaborate its characterizing aspects, as well as to categorize a set of target areas. At the very low level, one target of ICT4G is improving personal or social conditions with emphasis on medical assistance, taking into account cultural or language problems which could prevent to deliver a proper healthcare in a systematic way. At higher level, on the other hand, it should promote the conditions to fulfill and express society's “good” needs so that they can be self-motive and both solution owners than problems only.

Equally important target to discover is the communication among individuals. ICT should try to mitigate the sense of loneliness and alienation and provide the means to increase the sense of belonging to a group. Social networking can play a pivotal role in addressing these kinds of problems but they also need to include widespread coverage of ICT services for the society with low ICT penetration and/or scarce resources. Although not a necessity to transform life fundamentally, participative games can foster learning and critical thinking to be used in multiple dimensions of life.

In particular, this paper presents a different perspective of why the current solutions for solving (most of) the society's problems using ICT demand revisiting. On the basis of such viewpoints we recognize particular characteristics for ICT4G. We believe that ICT4G can bring various opportunities, besides the issues for its realization, among which, e.g., it offers a smooth mode of penetration for the developed world ended up with an embedded digital divide that is

hardly noticed and implicitly skipped.

The next section discusses viewpoints and characteristics that make ICT4G unique. The opportunities that ICT4G promises from multiple perspectives and the main challenges to realize those opportunities are discussed in Section III. Section IV relates the issues we raised to a recently finalized real-world national interoperability framework (i.e., eGIF4M). We present preliminary proposal indicating the roadmap to materialize ICT4G and concluding remarks in Sections V and VI respectively.

II. BACKGROUND AND CHARACTERISTICS OF ICT4G

A. Background for ICT4G

“Technology is only useful if it helps people improve their lives, not as an end in itself.” ... BILL GATES, 2009.

A digital society should benefit from ICT in various aspects of life ranging from getting ordinary public services to supporting day-to-day routine work via e-services and e-practices. So far, ICT had been used in addressing problems of the society in a biased way such that those who are lucky to be in the far-front got high penetration of ICT so quickly while those with low infrastructure and finance were deprived for so long. A recent report by ITU [18] on ICT development index shows no developing nation succeeded to make to top 10 out of 154 countries compared worldwide. It is also mentioned that although every country has shown individual improvement on ICT penetration, still developed nations are at the front-line which shows no significant change on the digital divide. The interest is not to revolutionize the ICT penetration, rather to make use of the under-utilized scarce infrastructure to better serve the under-served margin of the society and here comes one of the essences of ICT4G.

The impacts ICT brought in different walks of life are mostly so high-tech to witness in the local context and cultural protocol of the society. In most cases, it is not because the impact is unavailable, it is usually because the positive impact is not that apparent to the impacted. The approach of impacting life for the better should be tailored towards making the positive impact tangible and sensible by the beneficiary society. Most of the ICT projects and initiatives are reported to fail or succeed spontaneously due to the large scale, ambitious and risky fashion of revolutionizing the society with heavy deployment of ICT. Such a practice would definitely risk finance, human resource, time and above all society’s comfort and future credibility of the public servant. In ICT4G, the deriving direction to deploy ICT initiatives is to start with small and focus on impacting life in big horizons.

There is old fashion of development (see also [11], [19]). The traditional trend of developing ICT solutions was targeted at participating a representative of the society to approve the solutions meet the society’s expectation. This party

is usually a technical personnel with moderate (if not low) understanding and sense of the society’s problems leading to classical problem of requirement misunderstanding and consequently solving the wrong problem.

In ICT4G, we must take further the arguments made in [15]. Namely, we should stop thinking from a mono-disciplinary perspective and instead think more from a multidisciplinary perspective. We should stop focusing on the needs —often defined from outside the targeted societies in rather paternalistic terms. Instead, we must focus on the wants —what the societies themselves actually demand and how their communities would use digital technologies if left to their own devices.

In addition, with advances in technology we can further observe that ICT4G opportunities will more and more be provided out-side it. In this context technologies like mobile devices and wearable computing will be important drivers of change. According to the World Bank report [20], out of the 4 billion mobile subscriptions world wide, the 3/4 is in developing countries and 4 out of 10 have mobile phone in Africa. For instance, new applications are coming-up to healthcare sector to deliver the maximum services for the society —e.g, applications include remote monitoring of patients and automatic detection of disaster situations [5]. In fact, current leading healthcare system in the world — i.e., the UK healthcare system, has been criticized for its unsatisfactory support of ICT —e.g., lack of fit between ICT applications and environment, etc; pressure to deploy new ICT service before running experiment [14]. All these scenarios demand further investigations with respect to the support of ICT for the development, management, organization, and dissemination of services, ranging from the support of mobile and distributed processes to the environment-friendly and seamless integration of different devices and technologies.

B. Characteristics of ICT4G

From the examples and observations we made previously, we recognized the following characterizing aspects of ICT4G:

- **Seamless.** ICT should be seamlessly assimilated to improve the day-to-day life of the society for better access to health, shelter, food, education, justice, etc. Moreover, it should come down to the grass-roots of the context of the society than the society coming up to ICT.
- **Self-motivative.** ICT professionals should solve problems that they can sense, interested in and got talent to tackle as part of the society’s everyday life as a proof of solidarity for the society.
- **Environment-friendly.** ICT should not invade and/or disrupt the target society’s tradition, lifestyle and environment. Rather, it should add simplicity and convenience to get the best out of it and preserve it. Note

also that the environment can be particularly hostile, thus ICT-enabled services should somehow be able to provide the services in such environments.

- **Tangible and Measurable.** The positive impact of ICT on everyday life of the society should be tangible and witnessed by the beneficiary society. Moreover, it should be easy to measure the impact(s) of delivered ICT services. The service users (i.e., the society) should not face a problem to understand and use the services. Consequently, they should be able to speak about how the service changed their life.
- **Reproducible.** It should be easy to duplicate a certain ICT solution to a similar society of similar requirements with the least cost.

III. OPPORTUNITIES AND ISSUES OF ICT4G

A. Opportunities of ICT4G

Recognizing what is already described by other studies (see, e.g., [15], [10], [21]), we expect the following benefits from ICT4G.

Smoothen the penetration mode. The mode of ICT penetration is witnessed to be stagnant ([18]) for the developing nations due to countably many reasons such as low finance, low awareness, low priority, low infrastructure and low skilled human resource. This is argued as opposed to the smooth penetration of ICT to the developed world resulting in the widely mentioned digital divide. Nevertheless, the so called smooth mode of penetration for the developed world ended up with an embedded digital divide that is hardly noticed and implicitly skipped. Therefore, ICT4G can be an enabler to materialize painless penetration.

Open Cross-discipline platform. So far, ICT professionals were trying to struggle with real-world problems in their own closed professional door. We envision that ICT4G should tear this curtain and the time to see a Software Engineer, a lawyer, a Medical Doctor, etc sitting around a table talking about the same problem of their society is not too late. This should be different from the trend that the one discipline dominates the other. For example, it has been seen that ICT professionals tend to dominate the lawyers and visversa. The beauty is that of having unity in diversity. Instead, it makes sense to fix the defects of one by the qualities of the other. This ensures cross-disciplinary, open and cooperative mode of dealing with society problems.

Sense of ownership. It is a natural behavior of any society, big or small, that once the society recognizes a certain initiative as useful and the initiative is proved to be useful in deed, the chance that the society will decline to worry about the sustainability is almost zero. The positive side effect is nothing but building non shaking foundation for sense of ownership and sustainable support in the long run by the society itself.

Creating local Champion within the Community. A less exploited but very useful way of smoothly injecting life-

improvement technologies like ICT to a society is capitalizing on the tradition of focusing on local public figures/champions. By involving the local champions (e.g. famous athlete or footballer from that local society) in the advocacy and awareness creation, the society will follow the footprints of these people as a good practice.

Exploitation of scarce resources to the very best level. Resource scarcity should not be the major problem. Rather exploiting available resources to the last drop could be another angle of tackling the scarcity. Focusing on what we can do with whatever is at hand is the right and fair direction if ICT has to listen to the heartbeat of the society. On the other hand, one can exploit, for good, the proved benefits of prototyping so as to ensure societal participation, problem shaping and even discovery, bridging the vocabulary gap among technologists and the society at large. This also has a seemingly non-obvious but touching prospect in looking into how the problem discovery and shaping task is entirely shifted to the society while the solution provider is more liberated to think deep and act contextually to tackle the problem using ICT as weapon for a war that results with victory with no death (if not prolonging life).

Easy support of public administration (PA) processes. Supporting PA through ICT, for example, using business process reengineering (BPR) tools, techniques and methodologies is not new (see, e.g., [8], [9], [22], [23]). They mainly focus on facilitating (complex) government tasks. Unfortunately, several projects reportedly failed before their actual delivery of the intended services to the society (see, e.g., [13], [14], [15]). This particularly results in due to the applications are often built without deep investigation of the want of the society. Therefore, ICT4G could incorporate ways through which governments favor the society's interest while drafting strategic directions for ICT.

B. Challenges for Realizing ICT4G

In ICT4G, although it offers the opportunities discussed previously, it comes with the following challenges (see, e.g., in [2], [3], [4], [24] for other related issues).

- *No Unified Recipe.* The lack of unified thoughts to be used as recipes for lessons learned, good practices and methodologies in a consolidated manner. This imposes hard work on setting the ground resulting with significant investment of human resource, time and finance.
- *Lack of cross-fertilized professional mix or makeups.* Although there are skilled professionals in different disciplines, there is an observable shortage of cross-fertilized skill mix to deal with society-specific problems manifested in multiple dimensions requiring above a single area of specialization. We ourselves envision cross-disciplinary participation to solve problems of the society through ICT while we are still in a closed-disciplinary environment.

- *Interoperability.* Interoperability has been reported in a numerous platform from different context. In ICT4G, we face such interoperability, with emphasis on social interest focusing on human factors. The idea of human mind interoperability than that of systems, devices and standards is the most challenging view of the matter.
- *Compatibility with Legal and Social Norms.* Despite the evident globalization, only few studies have focused on issues involved with global ICT adoption (e.g., [24], [3], [4], [25]). Issues include, for example, integration of cross-disciplinary systems and deployment of global ICT systems. As more and more organizations compete in a global environment, the study of global ICT adoption becomes increasingly pertinent. More specifically, an important legal, procedural, cultural, as well as usability issue is guaranteeing how the adoption of ICT technologies are compatible with the digital societies with the actual environment. This is natural, since while introducing ICT-enabled services (e.g., through re-engineering) may result in a need to change (or affect) some parts of the environment. In this case, for example, the compatibility (and traceability) between laws and new processes must be preserved in order to determine how ICT interventions affect the original law. This raises an interesting question of how the issues change when ICT is the only viable means of working together.
- *Simulations and Prototypes.* So far a majority of us used to create simulation for a system, an application or a process within a closed environment (e.g., in computer labs). We claim that such simulation imitates the reality. But the fact on the ground is not always the same. With advances in technology we can further observe that ICT based simulations, which were previously confined to the labs, will more and more be provided on the areas where ICT did not penetrate (e.g., using Internet technology). As we all got used to prove that things work experimentally in the labs, simulation is so misleading as most of the critical real-life challenges are masked by assumptions. In dealing with real-life societal problems, simulation based on assumption would no more work. Therefore, in ICT4G we envisage to provide a prototype working system at the right environment.

IV. CAST STUDY: EGIF4M VS ICT4G

A. Context: eGIF4M

In 1998 the Government of Mozambique initiated a program to develop and define a national ICT policy. The mission of the project is to provide timely, accurate and above all integrated services for citizens, business and government. The preliminary investigation resulted in the release of the *ICT Policy Implementation Strategy*, approved by the Council of Ministers in 2002 and in an e-Government Strategy of 2006.

Several priorities are described including the establishment of a common communication platform and the building of an integrated framework to support the collaboration of an e-government agencies. This led to the need of a government Interoperability Framework (eGIF4M [1]) whose objective is enabling interoperability across the Mozambique's Public Administrations.

The implementation of any interoperability plan needs to take into account various factors, among which:

- time-span: the time-span for the implementation of an interoperability plan is relatively long
- sustainability: the implementation of an interoperability plan makes sense only if interoperability is maintained over the years.
- results: significant results can be achieved only if there is an "interoperability culture", that is, there is a diffused perception of the advantages interoperability brings to Governments.

The factors mentioned above collide with the limited availability of skilled resources in Mozambique, a problem the country shares with several developing countries.

To tackle these problems and foster a higher level of material and cultural well being, a knowledge transfer strategy from one country to the other is needed. That means to provide the necessary competences to the local society and gradually increase and enlarge the base of locally available ICT experts, in both public agencies and private sectors. The final result of this action would be to move the development process, strongly dependent on external support, to a collaborative one.

Skills and abilities are closely related to educational, research and innovative aspects (Figure 1).

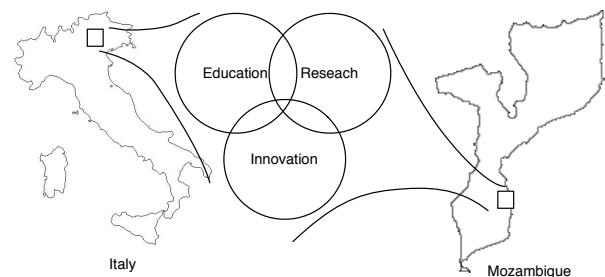


Figure 1. Knowledge transfer.

In eGIF4M, we intend to achieve this goal by building a education-research-innovation system, that fosters and promotes interchange of competences, personnel, and skills among the two countries. People are the main vector of such interchange. Student exchanges (similar to the Erasmus program), higher education, partnerships and collaborations on (common) problems, and the sharing of (research) know-how and competences are some of the tools to help such implementation.

B. ICT4G within eGIF4M

In this section, we highlight items pointed out in eGIF4M relevant to the aspects, opportunities, and challenges of ICT4G described in the previous sections.

First and foremost, the eGIF4M by itself is a remarkable step ahead showing the commitment of governments, one of the opportunities ICT4G offers in supporting public administration in a wider scope. For example, enabling ICT enabled public services like legal entry service, land management, driving license and the like are among many of the services government can facilitate using such a national framework so as to reach citizens in support of better life. Apart from supporting PA, the eGIF4M, after its initial implementation, could be a living example for alleviating lack of unified recipe of thoughts, lessons and guidelines mentioned as one challenge in ICT4G.

With regards to the aspects in ICT4G, the incorporation of interoperability maturity model in eGIF4M is noticeably interesting to measure the progress and impact of the framework. In the framework, four key elements of the maturity model are pointed out. These are identification of evaluation targets, set of maturity levels, goals, and a method to determine a maturity level. This is an indication that government initiatives like eGIF4M have paid reasonable attention to measuring impacts. ICT4G would shift the focus down to the society by supplementing the framework level measurement.

We mentioned smooth penetration as one of the potential opportunities of ICT4G. In line with this, in eGIF4M, is the focus given to penetration of interoperability at different levels of granularity such as government, agencies and individual citizens. The various services rendered by government to citizens (the society at large) are bridged by easy-to-reach and already in-use channels (e.g., one-stop-shop, telephone, radio, etc) to make the penetration diffuse smoothly.

The Maputo Living Lab, which is promised to reduce lack of skilled man power in realizing the eGIF4M and linking the various stakeholders like academia, research and industry is one significant step for the long journey of ensuring cross-fertilized mix of skills. Similar approaches (e.g., [11]) could also be used to capitalize the participation of professionals from multiple backgrounds and experiences.

As clearly stated on the eGIF4M documentation, Mozambique shares most of its socio-economic aspects with developing countries of similar profile. This, with a little variation, could be an opportunity to replicate the framework with low cost (e.g., deployment, training, infrastructure), locale sensitive (e.g., language, calendar) while maintaining legal and social norms.

V. THE WAY FORWARD: PRELIMINARY APPROACH AND ROADMAP

We argue that the existing approaches to deal with society problems are just copied from the classical ways of solving

almost all problems demanding ICT. One way to tackle society problems using ICT is employing a vertical approach either top-down or vice-versa. In top-down, the focus is on representative and large portion of the society and going down the hierarchy to small group of people and eventually to individuals. Such an approach may be attractive for a society with uniform demographic constituents while it is essentially difficult for a society with diversified mix of behavior. Oppositely, the bottom-up approach seems better though not still fore granted. Starting with individuals, followed by community-level local groups and eventually reaching the majority of the society as a collection of the small groups on the way-up is promising provided that we have concrete characterization of the local community, which is not always easy.

Our proposal as a way forward is to conduct an in-depth investigation and evaluation of the existing approaches so as to extract the feasible constituents and introduce a methodology encompassing the aspects of ICT4G stated in this paper.

The pillars of the methodology are academia, research, and living labs. The academic institutions bridge the gap of cross-disciplinary manpower while the research wing is where innovative ideas emerge. The glue to fix these two together is the living labs (e.g., European network of Living Labs²).

The methodology is expected to show society-sensitive identification and prioritization of contemporary society problems, production of quick-win prototypes with convincing outcomes and feedback, incremental refinement and enhancement for better outcomes and crafting a way for reproducing, dissemination and long-term handover to the society.

Furthermore, the methodology should take into account pertinent issues such as measurement of impacts before and after deploying ICT solutions in the society, ensuring scalability of ICT solutions to a reasonable scope and complexity, adaptability to a similar environment with least cost and inclusion of procedures dictating use of ICT solutions in real environments.

In line with this, defining concrete list and detail of requirements such as infrastructure, collaboration, policy-support, standardization and regulations is also one desirable direction to ensure the smooth scaling of ICT4G initiatives in the foreseeable future.

VI. CONCLUDING REMARKS

ICT should support an integrated, a participatory as well as a restorative underpinning approach that results in techniques, tools and processes for establishing ICT suitable for all conditions —i.e., for cultural, environmental, organizational, economic, etc.

²<http://www.openlivinglabs.eu/>

In this paper we presented viewpoints on the current trends using ICT to support the society and introduced a different perspective of it, —i.e., ICT4G. We mentioned the distinguishing aspects, potential benefits it offers, as well as the issues we may face to realize those benefits. We also suggested a preliminary roadmap of the way forward.

As a future direction, we look forward in establishing an initial working methodology with selected pilot project(s) and requirements set for ICT4G.

REFERENCES

- [1] P. Shvaiko, A. Villafiorita, A. Zorer, L. Chemane, T. Fumo, and J. Hinkkanen, “eGIF4M: eGovernment Interoperability Framework for Mozambique,” in *EGOV*, 2009, pp. 328–340.
- [2] W. J. Vankan, R. Maas, and M. t. Dam, “ICT Environment for Multi-disciplinary Design and Multi-objective Optimisation: A Case Study,” in *ICCS '02: Proceedings of the International Conference on Computational Science-Part I*. London, UK: Springer-Verlag, 2002, pp. 663–672.
- [3] R. C. Basole, “Enterprise Adoption of ICT Innovations: Multi-disciplinary Literature Analysis and Future Research Opportunities,” *Hawaii International Conference on System Sciences*, vol. 0, p. 419, 2008.
- [4] S. Qureshi and A. S. York, “Information Technology Adoption by Small Businesses in Minority and Ethnic Communities,” in *HICSS*, 2008, p. 447.
- [5] R. Lenz and M. Reichert, “IT Support for Healthcare Processes,” in *Business Process Management*, 2005, pp. 354–363.
- [6] R. Suomi, “Governance Structures for IT in the Health Care Industry,” in *Encyclopedia of Information Science and Technology (II)*, 2005, pp. 1305–1308.
- [7] Leslie Willcocks, W. Currie and S. Jackson, “Radical Re-Engineering and Information Systems: Evidence from UK Public Services,” in *Fifth European Conference in Information Systems*. Cork, 1997.
- [8] Marcel Thaens, Victor Bekkers and Hein van Duivenboden, “Business Process Redesign and Public Administration: a Perfect Match?” in *Taylor, J.A., Snellen, I.Th.M. and Zuurmond, A. (Eds.): Beyond BPR in Public Administration: An Institutional Transformation in an Information Age*. IOS Press, Amsterdam, 1997, pp. 15–36.
- [9] A. Ciaghi, A. Villafiorita, and A. Mattioli, “VLPM: A Tool to Support BPR in Public Administration,” in *ICDS*. IEEE Computer Society, 2009, pp. 289–293.
- [10] M. Buckley, H. Kershner, K. Schindler, C. Alphonse, and J. Braswell, “Benefits of using Socially-Relevant Projects in Computer Science and Engineering Education,” in *SIGCSE*, 2004, pp. 482–486.
- [11] M. Buckley, J. Nordlinger, and D. Subramanian, “Socially Relevant Computing,” in *SIGCSE*, 2008, pp. 347–351.
- [12] G. Despotopoulos, N. Perisinaki, and M. Kalogiannakis, “Information and Communication Technology (ICT) and Education: the Case of Distance Education,” in *EE'08: Proceedings of the 5th WSEAS/IASME international conference on Engineering education*. Stevens Point, Wisconsin, USA: World Scientific and Engineering Academy and Society (WSEAS), 2008, pp. 318–324.
- [13] R. B. Heeks, “Information Systems and Developing Countries: Failure, Success and Local Improvisations,” *Inf. Soc.*, vol. 18, no. 2, 2002.
- [14] D. E. Avison and T. Young, “Time to Rethink Healthcare and ICT?” *Commun. ACM*, vol. 50, no. 6, pp. 69–74, 2007. [Online]. Available: <http://dblp.uni-trier.de/db/journals/cacm/cacm50.html#AvisonY07>
- [15] R. Heeks, “ICT4D 2.0: The Next Phase of Applying ICT for International Development,” *Computer*, vol. 41, no. 6, pp. 26–33, 2008.
- [16] A. Villafiorita, K. Weldemariam, and R. Tiella, “Development, Formal Verification and Evaluation of an e-voting System with VVPAT,” *IEEE Transactions on Information Forensics and Security: Special Issue on Electronic Voting*, December 2009, to Appear.
- [17] A. H. Maslow, “A Theory of Human Motivation,” in *Psychological Review*, vol. 50 (4). Washington, DC: American Psychological Association, 1943, pp. 430–437.
- [18] ITU, “International Telecommunication Union, ICT Development Index (IDI).” [Online]. Available: http://www.itu.int/newsroom/press_releases/2009/07.html
- [19] B. Davey and A. Tatnall, “Where Will Professional Software Engineering Education Go Next?” in *Learning to Live in the Knowledge Society*, 2008, pp. 185–192.
- [20] WorldBank, “Global Monitoring Report 2009.” [Online]. Available: http://siteresources.worldbank.org/INTGLOMONREP2009/Resources/5924349-1239742507025/GMR09_book.pdf
- [21] M. Buckley, “Viewpoint - Computing as Social Science,” *Commun. ACM*, vol. 52, no. 4, pp. 29–30, 2009.
- [22] Paul Alpar, Sebastian Olbrich, “Legal Requirements and Modelling of Processes in e-Government,” *Electronic Journal of e-Government*, vol. 3, 2005.
- [23] Sebastian Olbrich, Carlo Simon, “Process Modelling towards e-Government – Visualisation and Semantic Modelling of Legal Regulations as Executable Process Sets,” *Electronic Journal of e-Government*, vol. 6, 2008.
- [24] Y.-T. C. Hung and M. T. T. D. Nguyen, “The Impact of Cultural Diversity on Global Virtual Team Collaboration A Social Identity Perspective,” in *HICSS*, 2008, p. 10.
- [25] B. Gupta, S. Dasgupta, and A. Gupta, “Adoption of ICT in a Government Organization in a Developing Country: An Empirical Study,” *J. Strateg. Inf. Syst.*, vol. 17, no. 2, pp. 140–154, 2008.