WHY DOES SOCIAL CONTEXT MATTER?
Integrating Innovative Technologies with Best Practice Models for Public and Behavioral Health Promotion

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Abstract: In this paper we will present a framework that is intended to guide synthesis of different theoretical perspectives for the purpose of developing strategies for integrating IT use in diverse social settings. First, we will briefly review existing theoretical models grounded in behavioural science; and present our company's approach for development of products using technology innovation that take in account the individual, organizational and contextual community characteristics. Secondly, we will illustrate this approach with three case study examples in the fields of public/behavioral health and education. Finally, we will conclude with theoretical and practical considerations that can be used by IT developers to maximize adoption and implementation of innovative technologies.

1 INTRODUCTION

It is universally acknowledged that information and communication technologies (ICTs or IT) hold huge potential for enhancing the effectiveness of services in different sectors. Their ability to reach new populations, improve communications, and transform service delivery can increase the effectiveness and social impact of private, public and non-profit initiatives. Yet, the positive effects of innovative IT will only be fully realized if, and when, they are widely spread and used. It is a well-accepted fact that the existence of technology does not guarantee its utilization. Attempts to promote the adoption and diffusion of innovative IT have often failed due to a lack of understanding of the factors that affect acceptance and use of technology by individuals and organizations. A notable example is the recent failure of the One Laptop Per Child (OLPC) project, which aimed to distribute millions of $100 laptops to disadvantaged school children but failed to anticipate the social and institutional problems that could arise in trying to diffuse technology in the developing country context (Kraemer, Dedrick, & Sharma, 2009).

As the OLPC case demonstrates, investigating social context is vital to understanding the acceptance and use of technologies. Researchers have often addressed the issue of why individuals and organizations who would benefit from technological systems do not use them but traditionally most of the research has focused on technological factors and has rarely been applicable to different sectors and social contexts (Al-Gahtani, 2008). With the rapid utilization of IT in different spheres of life and across geographical and economic dimensions, best practice models have shifted focus to the potential adopter and the organization or community into which the technology will be integrated. An adopter based, instrumentalist approach incorporating both macro- and micro-level perspectives now appears to be the most widely used to promote the adoption and diffusion of innovative ITs.

However, a gap exists between these best practice models and IT adoption strategies. In particular, the non-profit and public sectors as a whole lag behind the private sector in the adoption of technologies. There has been little scholarly research into the IT adoption in the non-profit and public sectors. This paper discusses ways that technology acceptance models can be utilized to develop multi-level approaches for facilitating IT adoption in diverse social settings (educational, health and community-based organizations) with special emphasis of the contextual characteristics that determine the success of this process.

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2 BEST PRACTICE IN TECHNOLOGY ADOPTION

2.1 Existing Theoretical Models

A rich body of literature has emerged that employs behavioural science theories to model factors affecting the acceptance and use of technology at both the individual level and the organizational level. Prominent examples include the Technology acceptance model (Davis, Bagozzi, & Warshaw, 1989), Theory of planned behaviour (Ajzen, 1985), Unified theory of acceptance and use of technology (Venkatesh, Morris, Gordon B. Davis, & Davis, 2003), Diffusion of innovation (Rogers, 1995), and the Technology, organization, and environment framework (Tornatzky and Fleischer 1990). Some of these models focus on technological and individual factors influencing acceptance but as models have become more sophisticated and better validated, there has been an increasing acknowledgement of the centrality of environmental and contextual constructs. Key constucts in these models that relate to contextual factors include compatability (with existing technology, work practices, beliefs and values), social influence, professional environment, organizational structure. In addition, many of the models discuss individual factors that are inevitably related to broader environmental and social contexts, such as attitudes, beliefs and subjective norms. A comparison of theories of change and contextual constructs defined in models of technology acceptance is presented in the Appendix.

Drawing from these theories we present a revised multi-contextual model, adapted from the extended technology acceptance model (Dadayan & Ferro, 2005) to incorporate broad social influences such as culture, community context, and ideologies that are critical for technology adoption in real life contexts (see Figure 1).

- Individual context refers to the characteristics of individual end-users and their attitudes to technology;
- Technological context refers to the characteristics of the technology such as functionality and user-friendliness; and
- Implementation context refers to the user's environment, including organizational factors (climate, support, readiness); broad social influences (community, culture, ideologies); and technology compatibility.

In the next sections drawing on the extensive experience of our company in developing innovative products for public and behavioural health promotion, we will outline the methodology that we use to examine these different characteristics for developing technology products that are adequately integrated within real-life contexts.

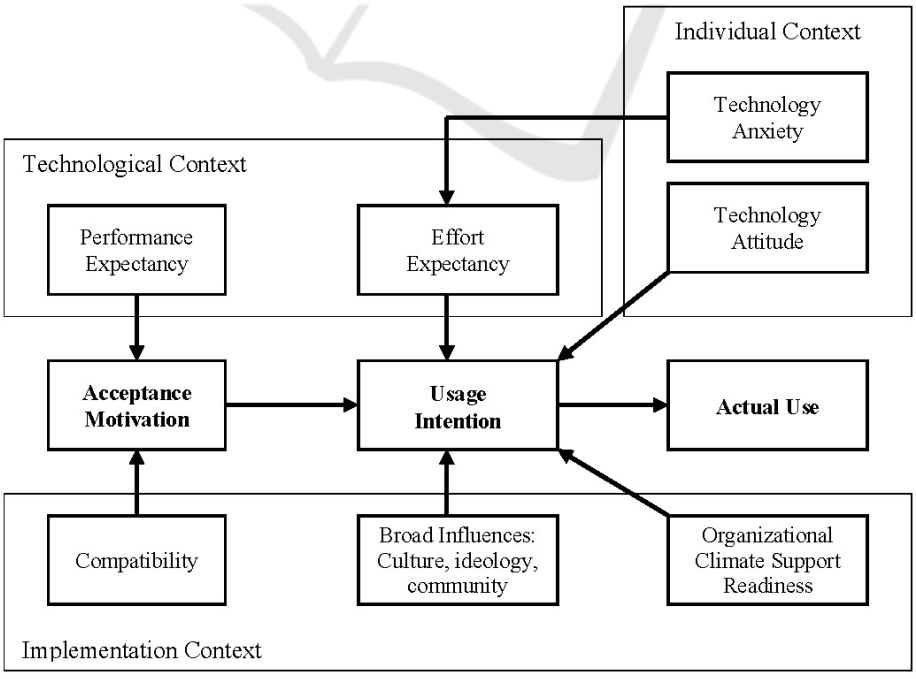

Figure 1: Revised Multi-contextual Model of Technology Acceptance.

2.2 Our Approach: The Intersection Between Research, Technology and User Needs

Established in 1983 and selected as an exemplary small business in 2007 by the National Academy of Sciences, Sociometrics' primary mission is to develop and disseminate behavioural and social science research-based resources for a variety of audiences in order to: 1) promote healthy behaviours; and 2) prevent or reduce behaviours that put an individual's health and well-being at risk.

During the last ten years, Sociometrics' staff has developed engaging IT public and behavioural health promotion products and has also accrued significant experience developing and disseminating research-based materials tailored for diverse target audiences through large scale websites, digitalized effective program materials, data libraries, and evaluation and training e-tools (see full description at www.socio.com).

All products are developed based on a thorough examination of user needs and preferences with a special attention to the contexts in which they will be implemented to assure their acceptance and relevance.

3 CASE STUDIES

3.1 e-Learning Products for Early Intervention Professionals

In this case example we present the process of developing interactive program tutorials tailored to the different learning styles of early intervention professionals working in diverse settings (child care centres, hospitals, and community-based centres). The project was part of a Sociometrics initiative funded by NIH aimed at assembling in one place—for public dissemination, distribution, and replication—treatment programs in the area of early childhood intervention. One of the important goals of the project was to design technology assisted professional tutorial materials to assist early childhood professionals to implement programs with fidelity in their professional settings. Following the principles of Dabbagh and Bannan-Ritland (2005) for on-line learning design, we first identified users' characteristics and learning styles and then explored their learning and professional context. Using interviews with potential users, observations of their professional context and reviews of relevant literature we were able to outline contextual characteristics that determined the design and technological modality of the professional tutorials (see Table 1).

3.1.1 Individual Context

The analysis of the individual context showed that technology based products are not used routinely by potential users, which determined relatively high technology anxiety; attitudes to technology vary among professionals with medical and administrative personnel being more positive. In response to this context we decided to create learning tools that are easy to use by people with no previous experience with technology.

Table 1: Context analysis for developing early childhood intervention professional tools.

Context	Early Childhood Intervention Contextual Characteristics	Solutions
Individual Context Technology anxiety Technology attitudes	Technology anxiety relatively high Attitudes vary among professionals but in most cases technology based products are not used routinely	Create learning tools that are easy to use by people with no previous experience with technology
Technological Context Performance expectancy Effort Expectancy	Performance expectancy is high; users will not use these tools if they do not believe that they will improve their direct work Based on the high work load and relative low level of technology skills, the effort expectancy is for easy use	Constructivist approach– learning by doing, e.g., cognitive apprenticeships, situated learning, problem-based learning, efficient learning (minimizes tangential activity) Practical (product of instruction is useful for everyday activity)
Implementation context Compatibility with existing technical systems Organizational support Professional culture	Technical system limited to basic software Technology support often is scarce Resistance to change; conservative organizational climates	System that is compatible with basic software Materials that will not require a lot of additional support Adaptable to diverse learners' styles and contexts

3.1.2 Technological Context

The technological context analysis showed that performance expectancy is high; users will not use these tools if they do not believe that they will improve their direct work; based on the high work load and relative low level of technology skills the effort expectancy is for easy use. To match these expectations we selected a constructivist approach for the pedagogical design of the products that is efficient and practical.

3.1.3 Implementation Context

We analysed several aspects of the implementation context: 1) compatibility with existing technological systems: most of the technical systems used by our users were limited to basic software, which meant that the professional tools should utilize basic software that is widely available; 2) Professional culture; most of the professionals worked in the non-profit sector, either at health or educational environments that have been shown to be relatively conservative and resistant to change (Botcheva et al.2003): thus the use of our tools should not require a lot of changes in the routine practices; they should be tailored to different professional environments and specific learner needs allowing customisation; 3) Organisational support of implementation: technology support is scarce in most of the organisations; thus the tools should be easy to maintain with minimum technical support.

This multi-level analysis led us to the decision to create e-learning materials using Adobe interactive PDFs that will include hands on examples and resources tailored to the different learning styles and experience of the individual learner. Interactive PDFs fit seamlessly into the complex pattern of diverse learners' needs, constraint and resources. On the one hand, they are: completely stable; typically get past firewalls; require no special software/system other than Adobe Reader; printable, and easy to maintain. On the other hand, they are: highly dynamic; allow audio, video, automations; indexing/bookmarking and easy linking. These characteristics helped us to create interactive and engaging e-learning tools that fit the context of and user characteristics of early childhood professionals.

3.2 Using the Individual, Technological and Implementation Context to Design e-Tools for Data Collection

Public schools in the United States are required to annually collect and report data on drug use and other high-risk behaviours from elementary, middle and high school children. All schools receiving federal and state funding are expected to collect baseline data for establishing incidence or prevalence of data on truancy rates, drug and violence related suspensions and expulsions, drug incidence, and prevalence rates, and for demonstrating simple percentage changes in outcomes for end of the year performance reports.

It is often difficult, however, for schools to engage in periodic data collection efforts in the light of budget constraints and time constraints (Mantell, Vittis, & Auerbach, 1997; Sedivy, 2000). Teachers are expected to take on responsibilities other than teaching even at a time when there are increasing pressures on them to raise students' academic achievement levels. Thus, collection and monitoring of data on substance use or other health concerns are perceived as consuming valuable time (Hallfors, Khatapoush, Kadushin, Watson, & Saxe, 2000). In response to this need, Sociometrics designed a web-based survey development and analysis tool that would allow for swift, efficient and most importantly, cost-effective data collection, analysis and reporting. The online system would allow students to login to a pre-programmed survey with measures on drug use patterns, truancy and other high risk behaviours; answer the survey questions; then logout once he or she is finished. The survey data would automatically be deposited in a secure web server and can be accessed by the teacher for analysis. Such an e-tool is cost effective as it automates the survey creation and administration process, and relieves the teacher of burdensome tasks such as printing surveys, distributing them and then entering and processing the data.

In designing such a tool, we first started with a needs assessment that took account of the larger operational context: specifically, we investigated the wide range of constraints, limitations and facilitating factors at the individual (teacher), technological (school infrastructure), and implementation context (school). We first identified the primary consumers of the product. These included not just school teachers and principals who were responsible for the data collection and reporting, but also district and state level supervisors at the State Department for Education who were responsible for school funding allocations and monitored school progress. Next, we conducted numerous focus groups and interviews with the target audience. The qualitative studies yielded useful insights into current data collection efforts in schools, and offered valuable design,

content and dissemination guidelines for our e-tool. Some of these insights are outlined below.

3.2.1 Individual Context

Teachers began their data collection efforts by selecting measures, creating paper and pencil surveys, and administering the surveys in the classroom during recess, after school hours or whenever possible, during a health education class. The data were coded and entered by hand and then reported to the district. The schools had to provide districts with end of the year "performance reports" which reported simple changes in drug and violence incidents over the school year as part of their assessment. Numerous problems with the process were reported, such as insufficient funding and time, as well as lack of technical assistance. Those in the poorly funded districts mentioned high student movement and attrition, and problems in tracking students. Teachers complained about the time and effort involved in tracking such data and preparing reports. They also complained about not receiving any form of technical assistance from their districts in terms of selecting appropriate measures. Many teachers lacked the capacity to conduct basic statistical analysis such as means, and percentage changes in key behavioural indicators. It therefore became clear to us that any online data collection tool would need to pre-program measures and indicators that were popular, reliable and validated. We conducted a poll of the most popularly used measures and indicators for capturing school performance and developed pre-programmed surveys incorporating such indicators. A basic statistical tool was developed that would allow teachers to derive summary statistics such as means and frequencies (e.g. no: of student arrests on drug related charges, percentage of boys and girls referred to treatment services etc) without having download data or use any external software such as SPSS. (Teachers were also given the option to download the data if they desired). Finally, it became clear that because of time and capacity limitations, an interface needed to be created that would allow students to take the survey from multiple locations, and over different points in time. This realization led not only in interface design changes, but also the format and structure in how data were to be stored.

3.2.2 Technological Context

One major concern that emerged was whether the introduction of a new, online data collection system would introduce a steep "learning curve" for teachers. Another concern was related to the investments that the school would be required to undertake in order to adopt it. To emphasize the utility and user-friendliness of the e-tool, we decided to present our product concept in images and terms that were already familiar to the groups. For example, we used an existing online survey system—SurveyMonkey—to illustrate our e-tool and the precise manner in which it would different and specially tailored for their school needs. Some of the school teachers in the focus group were already using online teacher evaluations: we encouraged them to speak to the group about their experiences (both positive and negative), and highlighted how our product would attempt to overcome the limitations and replicate the successes of their experience. By the end of our needs assessment, teachers and administrators were by and large, receptive to the idea of online data collection indicating that our strategies for reducing "technology anxiety" and establishing "performance expectancy" were successful.

3.2.3 Implementation Context

During the design and product development stage of any school-based e-tool, it is absolutely essential to ensure its compatibility with the school's technological infrastructure. A technology "screener" was mailed out to the focus group participants and interviewee's participants in order to assess the basic "minimum" technological capacity that the e-tool would have to be compatible with. Questions included: number of computers in the school, Internet access, and bandwidth etc. While almost all schools in our focus group had Internet access, it became clear that lack of access to sufficient computers (along with time constraints) was yet another feature that necessitated group log-ins from multiple locations (such as libraries, computer labs and even homes). Privacy and confidentiality of student data subsequently emerged as a concern. As a first step, we designed a single question interface with autoprogression; the screen automatically gets refreshed once a question was answered thereby minimizing the amount of time a response was present on screen. The interface also included separate login IDs for students and administrators. Students could use their IDs to login from any location that was convenient to them while the administrator had sole control over the data collected. Administrators using the online statistical tool (described earlier) would be able to do so without accessing individual student data. If the

administrator did choose to download the data, the downloaded data was made available *without subject identifiers* in order to maintain confidentiality.

Besides confidentiality, another concern was related to product pricing and affordability. Participants identified "frontline" funding and decision making agencies and offices at the state, county and district level that could spearhead the use of online data collection mechanisms in their districts. We learned that pursuing business opportunities with state and district agencies (rather than individual schools) would allow costs to be incurred by these agencies and would facilitate large scale adoption of the technology at the ground level.

4 IMPLICATIONS FOR DEVELOPERS

There are several theoretical and practical implications for developers that stem from this analysis.

First, the review of existing theoretical models of technology acceptance highlight the importance of developing multi-dimensional approaches that take in account different social contexts to fully understand the processes of technology integration in real life contexts. Interdisciplinary teams incorporating the knowledge and skills of technology developers, social and behavioural scientists will be best suited to solve this problem.

Second, the analysis of technology acceptance in the non-profit sector highlights the critical importance of broad social context, such as culture, ideology, and community climate. While in industry, the transition from research and development to the field primarily focuses on the end user, in the non-profit sector, there is a range of intermediary factors (agencies, policies) that influence if and how the product reaches the end user. Thus, conventional theories regarding technology diffusion and adoption need to be modified with regard to the non-profit and public sectors.

Third future research and development effort should focus on development of practical tools and screeners that will facilitate the translation of contextual characteristics into technical requirements for development of products that can be easily adopted and integrated in real life contexts.

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APPENDIX

Table 2: Comparison of theories of change and key contextual constructs in models of technology acceptance.

Model and authors	Theory of change	Key constructs related to context
Technology, organization, and environment (TOE) framework (Tornatzky and Fleischer 1990)	At the organizational level, three aspects influence the process by which an enterprise adopts and implements a technological innovation: technological context, organizational context, and environmental context.	Environmental context is the arena in which a firm conducts its business—its industry, market structure, competitive pressures, technology support infrastructure and government regulation.
Theory of planned behavior (TPB) (Ajzen 1985, Ajzen 1991, Bajaj and Nidumolu 1998)	At the individual level, behavior is influenced solely by behavioral intention and behavioral intention in turn is influenced by attitudes toward behavior, by subjective norms and by perceived behavioral control.	Behavioral intention is influenced by attitudes, subjective norms and perceived control but these are not explicitly linked to broader environmental context.
Diffusion of innovation (DOI) (Rogers 1995)	At both individual and organizational level, innovations are communicated through certain channels over time and within a particular social system. Diffusion through an organization is related to individual (leader) characteristics, internal characteristics of organizational structure, and external characteristics of the organization.	The external characteristics element of the model refers to system openness.
Technology acceptance model (TAM) (Davis 1986, Davis 1989, Davis et al. 1989)	At the individual level, "perceived usefulness" (outcome expectation) and "perceived ease of use" (self-efficacy) influence decisions about how and when individuals will use a new technology, with intention to use serving as a mediator of actual use.	External variables may be antecedents or moderators of perceived usefulness and perceived ease of use. However, there is an assumption that when someone forms an intention to act, that they will be free to act without limitation.
Multi-contextual technology acceptance framework (Hu et al. 1999, Chau and Hu 2002)	At the individual level, technology acceptance behavior is influenced by factors pertaining to the individual context, the technological context, and the implementation context.	"Implementation context" refers to the user's professional environment.
Unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. 2003)	At the individual level, technology use is directly determined by performance expectancy, effort expectancy, social influence, and facilitating conditions. The impact of these factors is moderated by gender, age, experience, and voluntariness of use.	Social influence refers to the degree to which an individual perceives that others believe he or she should use a particular technology. Facilitating conditions refer to the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular technology.
Extended technology acceptance model (Dadayan and Ferro, 2005)	At the individual level, technology acceptance is influenced by not only technological factors but also by the individual context and the implementation context.	The implementation context includes three determinants — compatibility, social influence, and organizational facilitation.
Not-for-profit internet technology adoption model (O'Hanlon and Chang 2007)	At the organizational level, technology adoption is influenced by technical capacity, compatibility (with the organization's work practices, beliefs and values), support (of staff and donors), and organizational characteristics.	Organisational practices, beliefs and values are critical for the adoption process.