

## Research Article

# Skills Are Not Binary: Nuances in the Relationship Between ICT Skills and Employability

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## Abstract

*In regions with developing or transitioning economies, information and communication technology (ICT) skills are expected to provide potential employees a significant edge in securing comparatively high-paying jobs. However, ICT skills are not binary (i.e., there are ranges and levels of ICT skills), nor are the effects of ICT skills common across all contexts. To plan international development efforts that have the most impact on improving people's employability, we need more information about the relationship between ICT skills and employment, such as which ICT skills and what level of skill are sufficient for improving employability. In this article, we examine ICT skills and employment in the context of a transitioning economy, using the Central Asian nation of Kazakhstan as a case study. Findings indicate that while ICT skills can be a predictor of employment and are associated with higher income, the level of ICT skill required to attain these jobs is not as high as one might expect. Skills that are considered basic computer literacy in the developed world are, in many developing and transitioning countries, considered sophisticated skill sets held by small segments of the population. In a developing world context, these skill sets are associated with high prestige jobs, especially when they are combined with other factors, such as higher education. This finding has interesting implications for designing development programs to improve employability, suggesting that training efforts should focus on what are considered advanced ICT skills in the local context.*

## Introduction

Information has become a central component of modern economies, societies, education, and employment. Having transitioned from the Industrial Age, we now live in what has been variously called the information age (Castells, 1996; Dizard, 1982; Mosco, 1989), information society (Martin & Butler, 1981; Lyon, 1988), computerized society (Martin & Norman, 1970), age of information (Helvey, 1971), information economy (Porat, 1977), knowledge economy (Kim & Mauborgne, 1999; Neef, 1997), and information revolution (Lamberton, 1974). In the context of a globalizing information age, information and communication technology (ICT) skills are becoming more widespread and are considered a prerequisite to securing professional employment in much of the world.

Particularly in regions with developing or transitioning economies, ICT skills are expected to pave a path out of poverty, or at least to provide a primary step toward securing higher-paying jobs (Ashcroft & Watts, 2005; López-Bassols, 2002; Steinmueller, 2001). However, ICT skills are not binary, nor are the effects of ICT skills common across all contexts. A deeper

look into the relationship between ICT skills and employment is needed to produce a richer picture of *whether* ICT skills are associated with employability, as well as *which* ICT skills and *what level* of skills are associated with increased employability. To begin to fill this gap, we examine ICT skills and employment in the context of a transitioning economy, using the Central Asian nation of Kazakhstan as a case study. In this article, we address the following research questions: Who uses ICTs in nations with transitioning economies? What is the relationship (if any) between ICT skills and employment? How significantly, if at all, do ICT skills predict employment? What level of ICT skill is associated with increased employment? How do the people leading ICT usage trends actually use technologies—both inside and outside of the workplace? Based on specific factors that are associated with employability, as well as on the type and level of ICT skills used by workers in the case study country, this article suggests potential development opportunities that could impact employability within a specific context.

In the following sections, this article presents relevant background information about Kazakhstan as a transitioning economy and an overview of ICT usage at the national level. This background information provides a foundation for the more specific data that follows. We use two sets of data for our analysis: survey data and an interview study. The survey involved 1,000 respondents, representing a broad spectrum of the general public in Kazakhstan, identifying patterns in the relationship between employment and ICT usage, as well as other factors. The interviews were conducted with 18 employees of an airline company in Almaty, Kazakhstan, focusing on their experiences with ICTs in the workplace. Considered alongside information about ICT use and employment of the general public in Kazakhstan, these interviewees represent the earliest users of multiple ICTs, including mobile phones, computers, and the Internet. Thus, the interview data provides a richer and more detailed picture of what are considered advanced ICT skills within the post-Soviet transitional context. The final section of this article suggests areas of future research which may further contribute to a deeper understanding of the relationship between ICT skills and employment in developing or transitioning regions, and, more specifically, may also identify the ICT skills that improve employability in those regions.

## Background

This section provides a background on Kazakhstan's transition from Soviet to independent rule and the effects of that transition on employment opportunities. It also overviews ICT usage at the national level to provide a foundational understanding of what constitutes a typical level of ICT skill in Kazakhstan.

Kazakhstan was a republic of the Soviet Union for more than 50 years before gaining independence in December 1991. Upon release from Soviet rule, the nation almost immediately initiated social and economic reforms to transition to a market economy (Safavi, 1997). Kazakhstan joined the World Bank, the IMF, the European Bank for Reconstruction and Development, and the Asian Development Bank in its efforts to encourage foreign investment and joint ventures. The new government's privatization program changed the ownership of more than 9,000 businesses in the first two-and-a-half years of independence and had registered more than 1,400 joint ventures with foreign investors by April 1994 (Nourzhanov & Saikal, 1994; Safavi, 1997). By early 2002, the U.S. Department of Commerce had granted Kazakhstan market economy status in recognition of the substantive economic reforms in currency convertibility, wage rate determination, openness to foreign investment, and allocation of resources (U.S. Department of State, 2007). After an initial and severe decline, Kazakhstan's economy has grown rapidly due to significant foreign investment and development in the country's oil and natural gas resources (Djalankuzov et al., 2004). Kazakhstan's gross domestic product has grown by an average of more than 9% annually, and income per capita has significantly increased in the last decade (Mirola, 2008).

The country, however, continues to face several challenges to long-term development, particularly regarding the competencies and competitiveness of its human capital base (Mirola, 2008). Kazakhstan's health and education systems are not effectively enhancing labor productivity, and there is a particular shortage of laborers with engineering and management skills (World Bank, 2005). Safavi (1997) identifies two factors that are key to long-term development in Kazakhstan: foreign investment and a labor force with the appropriate skill sets to manage businesses and opportunities resulting from

Table 1. Internet subscribers and users in Kazakhstan and the United States, 2005 and 2007.

Country	Internet Subscribers				Internet Users			
	Total		per 100 inhabitants		Total		per 100 inhabitants	
	2005	2007	2005	2007	2005	2007	2002	2007
United States	56,992,800	72,721,000	19.86	23.78	159,000,000	220,000,000	55	72
Kazakhstan	301,600	683,100	2.03	4.43	609,200	1,900,000	4	12

Source: ICT Statistics Database. International Telecommunications Union, <http://www.itu.int/ITU-D/ict/ey/Indicators/Indicators.aspx#>

foreign investment. While foreign investment is significant—USD \$46 billion has been invested for extraction and use of natural resources—the labor force lacks the skill sets to fully benefit from this investment and the resulting employment opportunities. The shortage of workers with business, management, computer, and engineering skills hurts local and foreign-owned businesses because it is expensive to train employees in these skills. Moreover, training often results in increased competition for these skilled employees, creating frequent turnover (World Bank, 2005).

Like many transitional and developing regions, Kazakhstan has substantially lower Internet penetration than Western nations such as the United States or Germany. However, mobile phone usage has spread quickly throughout the country, becoming commonplace in recent years. For example, in 2007, Internet users comprised 12% of Kazakhstan's population, and only 2% were broadband subscribers, compared, for example, to 73% Internet usage and 24% broadband subscription in the United States (International Telecommunication Union, 2009). As shown in Table 1, in 2005, when our interviews were conducted with airline employees in Kazakhstan, only 4% of the population was using the Internet.

The next section describes the methodology for this study, specifically describing the 1,000-respondent survey in 2008 and the interviews with 18 airline professionals in 2005.

## Methods

The Central Asia Information and Communication Technology (CAICT) project is a five-year, longitudinal study of ICT use in four Central Asian nations: Kazakhstan, Kyrgyzstan, Uzbekistan, and Tajikistan.

CAICT research includes broad social surveys, interviews, ethnographic observation, policy monitoring, Web archiving, focus groups, technology prototyping, and design ethnography. The project focuses on investigating ICT adoption and adaptation patterns in order to inform design efforts, and the project has generated hardware and software prototypes based on research findings. The data in this article comes primarily from two sources: a 1,000-respondent survey conducted in Kazakhstan in 2008 and domain-specific interviews conducted with 18 airline employees in Almaty, Kazakhstan, in 2005.

## Survey

This section describes the respondents who were interviewed for the surveys, details on the design of the survey instrument, and the procedures used to choose the sample and analyze the data.

The survey sample included 1,000 respondents, age 15 and older, from Kazakhstan. The survey was administered between July and August 2008 in urban and rural areas from several regions of each country. The sample was based on census information on age, gender, ethnicity, and geographic location released by the government.

The survey instrument was designed by a team of researchers from the University of Washington in Seattle, Washington. The survey is part of a multi-year, multi-phase project on patterns of ICT adoption and adaptation in Central Asia. Given the low rate of current Internet penetration in Central Asia, the survey also focuses on pre-existing patterns of information use, information-seeking behavior, and levels of trust in various producers and sources of information. The survey was conducted twice before, in January–March 2006 and April 2007.

The survey, containing over 300 variables, was

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administered by BRiF Research Group located in Kazakhstan. BRiF Research Group was responsible for translation of the survey instrument from English to Russian and Kazakh, and the University of Washington team then back-translated the completed Russian translation.

Households were selected by a random walk procedure; only one respondent was interviewed in each selected household. Each respondent was chosen using the Kish grid method, a common technique to assure a random selection of household members. All interviews were conducted face to face; no other household members were present in the room at the time of the interviews. Additionally, strict confidentiality was guaranteed to the respondents. The average length of an interview was approximately 45 minutes. Several steps were taken to guarantee high-quality fieldwork, including 1) interviewers were trained through workshops, and they practiced in a pre-testing phase; 2) approximately 30% of interviews were checked through a back visit to the respondent's home; and 3) statistical analysis of logical inconsistencies were double-checked with the original paper questionnaires and eliminated if necessary.

The survey data that informed this article was analyzed as follows. First, we determined employment by coding responses to the question, "Are you self-employed, do you work for someone else, do you do both, or are you unemployed right now?" Response codes included 1) self-employed, 2) employed, 3) employed part-time, 4) not employed, 5) student, 6) retired, and 7) homemaker. Respondents were considered employed full-time if they were either 2) employed ( $N = 443$ ; 44%) or 1) self-employed and had identified the sector of the economy in which they worked ( $N = 100$ ; 10%), resulting in a total of 543 respondents considered to be employed full-time.

A direct logistic regression analysis was performed using the software program SPSS (version 13) to predict employment on the basis of four demographic variables (age, gender, the number of years of completed schooling, and living in an urban versus rural location) and five variables related to technology. Four of the technology-related variables were dichotomous variables: 1) computer use (not necessarily at work), 2) Internet use (not necessarily at work), and the ability to speak and read 3) English and 4) Russian, which are both common Inter-

net languages in the region. One technology-related variable was continuous: advanced ICT skills, which was a variable we created ranked on a scale of 0–5 comprised of adding responses to 1) using e-mail + 2) buying products online + 3) searching for a job online + 4) searching for school or training online + 5) using online banking. The advanced Internet skills were combined into one variable because of the low rates for any one skill. Following the direct logistic regression, we performed follow-up analyses to investigate two questions: 1) Do people who use a computer *at work* make more money? And 2) do people who use the Internet *at work* make more money?

## Interviews

In August 2005, co-author Johnson and a citizen of Kazakhstan, who was at the time pursuing a master's degree at Iowa State University and a research assistant on the CAICT project, conducted 18 semi-structured interviews of employees at a Kazakhstan airline (referred to here as Kazakh Air). The administration department of the airline selected the interviewees to represent a cross-section of the company in terms of department, profession, and skills. Thirteen interviewees were female and five were male. (One additional employee was interviewed, but he was excluded from our analysis because he was from the UK; all other interviewees were born and reared in Kazakhstan.) Interviewees were in their 20s or 30s, and the mean age of interviewees was 28; the most common age was 25. Seven interviewees worked in the finance department, four in scheduling and logistics, three in mechanics, two in customer service, two in training coordination, and one in security. All interviewees had at least some university education, most with degrees, certificates, or licenses in their field and additional training on the job. The interviews focused on experience with ICTs, particularly in the workplace, and were conducted in English or Russian.

Kazakh Air is a joint-venture company between the Kazakh government and an international company based in the UK. The airline began operation in 2002, three years before the interviews. Kazakh Air is the only airline in Kazakhstan to maintain its aircraft fleet to European Union standards. According to interviewees, the company had approximately 900 employees, with European pilots and top man-

agers and Kazakh nationals at the next level of management and below.

All interviewees said that they speak Russian and English at work. English is the lingua franca for the airline industry, and company reports are written in English. Several interviewees made the distinction that they speak English with management and Russian with their colleagues. Fewer than half of the interviewees said that they speak Kazakh at work, and then only rarely. Requirements for English fluency and computer literacy may partly explain why so many of the employees are young. Despite the prevalence of English, there was a wide range of competencies in respondents' abilities to understand and respond to interview questions in English, and therefore, some interviews were conducted only in Russian or switched to Russian midway through.

## Findings and Discussion

This section presents data from the survey and interviews to create a detailed picture of ICT use and the relationship between ICT skills and employment. In addition, this section explores implications of the findings relevant to improving employability in the context of developing or transitioning economies by examining associations between ICT skills and employability.

### Internet and Employment

*Finding: Variables related to technology predict employment at a statistically significant level, as do demographic variables.*

A direct logistic regression was performed with SPSS (version 13) using the employment status variable as the outcome. The model included four demographic variables: age, gender, number of years of schooling, and whether the respondent lived in an urban versus rural area. The model also included five variables related to technology: computer use, Internet use, ability to speak and read English, ability to speak and read Russian (both common languages used on the Internet), and advanced ICT skills. Two cases were omitted due to missing data, leaving 998 respondents available for analysis in the regression model. Correlations between model variables are shown in Table 2.

A test of the full model with the set of predictors against the null model with no predictors was significant,  $\chi^2(9, N = 998) = 181.33, p < .001$ ,

Nagelkerke  $R^2 = .222$ , indicating that the set of predictors reliably distinguishes between those who are employed and those who are not. The set of predictors accounted for approximately 22% of the variance in employment. The classification table shows 62% of unemployed respondents predicted correctly (model specificity) and 77% of employed respondents predicted correctly (model sensitivity), with an overall hit rate of 70% (which is an improvement from the null model's hit rate of 54%). See Table 3.

According to the Wald criterion, seven variables reliably predicted employment, listed here in order of influence: 1) the number of years of schooling, 2) gender, 3) advanced Internet skills, 4) using the Internet, 5) the ability to speak and read English, 6) the ability to speak and read Russian, and 7) age. See Table 4.

The model predicted a probability of employment at approximately 38%, holding all variables at their mean (or mode). In other words, if a respondent was of average age (39.7 years), had 11.7 years of schooling, was female, lived in an urban location, spoke and read Russian, but neither spoke nor read English, and did not use a computer or the Internet, the model predicted a 38% probability that the respondent would be employed.

Years of schooling was a significant predictor,  $b = .27, SE = .03, Wald(1) = 79.03, p < .001$ . If respondents had one standard deviation above the mean in schooling (Mean (11.69) + SD (2.69) = 14.38 years), their predicted probability in employment increased by approximately 12.0%, holding all other variables constant at their means (or mode). Conversely, if a respondent reported one standard deviation below the mean in schooling (Mean (11.69) - SD (2.86) = 9.00 years), the probability of working full-time dropped by 7.7%, holding all other variables constant at their mean (or mode).

Gender was also a significant predictor,  $b = .98, SE = .14, Wald(1) = 47.30, p < .001$ . In follow-up analysis, 45% of females were employed, while 66% of males were employed. Females outnumbered the males in the final sample; there were 547 females and 451 males. (The gender balance is different in our interview sample.)

Advanced Internet skills were another significant predictor,  $b = .58, SE = .17, Wald(1) = 11.59, p < .05$ . The mean score was very low in this sample. With a range from 0-5, the mean score was only 0.34, meaning that most respondents (836 respon-

Table 2. Correlations between variables in the model.

	<b>M</b>	<b>Spread</b>	<b>n</b>	<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>	<b>7.</b>	<b>8.</b>	<b>9.</b>	<b>10.</b>
1. Employed	1.0	[54%]	1000	—									
2. Age	39.7	(15.95)	1000	-0.08*	—								
3. Gender	0.0	[45%]	1000	0.21*	-0.02*	—							
4. Schooling	11.7	(2.69)	998	0.32*	-0.13*	-0.02	—						
5. Rural	0.0	[44%]	1000	-0.08*	0.04	0.02	-0.19*	—					
6. Computer use	0.0	[41%]	1000	0.09*	-0.47*	0.00	0.33*	-0.24*	—				
7. Internet use	0.0	[19%]	1000	0.10*	-0.28*	0.06	0.29*	-0.21*	0.57*	—			
8. Advanced ICT	0.3	(0.86)	1000	0.14*	-0.22*	0.05	0.30*	-0.19*	0.48*	0.84*	—		
9. English	0.0	[7%]	1000	-0.03	-0.25*	0.02	0.08*	-0.09*	0.29*	0.26*	0.28*	—	
10. Russian	1.0	[94%]	1000	0.10*	0.01	0.06	0.08*	-0.14*	0.08*	0.12*	0.10*	0.07*	—

Notes. In the M column, means are reported here for continuous variables: age, number of years of schooling and advanced ICT skills. Modes are reported for dichotomous variables: employed, gender, rural versus urban, computer use, internet use, ability to speak English, and ability to speak Russian. Schooling represents the number of years of formal education. Rural represents rural versus urban, where rural was coded 1 and urban was coded 0. Gender was coded 0 female, 1 male. In the Spread column, parenthetical values are Standard Deviations (SD), and bracket values [%] are percentages of respondents coded 1 in the sample.

\*  $p < .05$ .

Table 3. Classification table.

	Predicted		Percentage Correct
	Not Employed	Employed	
Not Employed	281	174	61.8%
Employed	127	416	76.6%
<i>The cut value is .500</i>		Total (hit rate)	69.8%

Table 4. Multiple logistic regression predicting employment.

	$\chi^2(9)$	Nagelkerke $R^2$	<i>b</i>	(SE)	Wald(1)	exp( <i>b</i> )	95%	CI
<i>Model</i>	181.32	.22						
Intercept			-3.95	(0.58)	46.08*	0.02		
Age			-0.01	(0.01)	4.15*	0.99	0.98	1.00
Gender			0.98	(0.14)	47.30*	0.37	0.28	0.50
Schooling			0.27	(0.03)	79.03*	1.31	1.24	1.40
Rural			-0.13	(0.15)	0.79	1.14	0.85	1.52
English			-0.82	(0.31)	7.12*	2.27	1.24	4.14
Russian			0.66	(0.30)	4.83*	0.52	0.29	0.93
Computer use			-0.13	(0.19)	0.44	1.14	0.78	1.65
Internet use			-1.04	(0.36)	8.30*	2.84	1.40	5.77
Advanced ICT			0.58	(0.17)	11.59*	1.79	1.28	2.50

Note.  $N = 998$ .

\*  $p < .05$ .

dents) reported no advanced Internet skills. Of the remaining 164 respondents who did report advanced Internet skills, 27 scored one, 32 scored two, 44 scored three, 5 scored four, and only 1 respondent scored five. The predicted probability of employment decreased slightly by 2.2% if the respondent reported no advanced Internet skills, holding all other variables constant. Conversely, predicted probability increased dramatically with each point scored for advanced Internet skills: for a score of one, the predicted probability of employment increased by approximately 6.2%; for two, it increased by 17.9%; for three, it increased by 31.8%; for four, probability increased by 46.1%; and for a score of five, the predicted probability of full-time employment increased by 58.6%, holding all other variables constant at their mean (or mode).

Internet use was also a significant predictor,  $b = -1.04$ ,  $SE = .36$ ,  $Wald(1) = 8.30$ ,  $p < .05$ . In follow-up analysis, 22% of those who used the Internet were employed, while only 14% of Internet users were not employed. While this percentage

seems low, those who did not use the Internet dramatically outnumbered those who did in the final sample: There were only 185 Internet users, but there were 815 non-users.

The ability to read and speak English was a significant predictor in the model,  $b = -.82$ ,  $SE = .31$ ,  $Wald(1) = 7.30$ ,  $p < .05$ . However, English did not have a positive association with employment. While relatively few respondents spoke and read English in the sample (less than 7%), only 6% of employed respondents spoke and read English.

The ability to read and speak Russian was positively associated with employment,  $b = .66$ ,  $SE = .30$ ,  $Wald(1) = 4.83$ ,  $p < .05$ . Most respondents in our sample spoke and read Russian (over 94%), with 96% of employed respondents claiming the ability to speak and read Russian.

Finally, age was also a significant predictor,  $b = -.01$ ,  $SE = .01$ ,  $Wald(1) = 4.15$ ,  $p < .05$ . If respondents were one standard deviation above the mean in age (Mean (39.7) + SD (16.0) = 55.7 years), their predicted probability of employment de-

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creased by approximately 4.8%, holding all other variables constant at their means (or mode). Conversely, if a respondent reported one standard deviation below the mean in age (Mean (39.7) – SD (16.0) = 23.7 years), the probability of employment increased by 2.4%, holding all other variables constant at their mean (or mode).

Thus, while education and gender were the most accurate predictors of employment, some technology-related variables (Internet use and advanced ICT skills) were also positively associated with employment. This finding demonstrates that gaining ICT skills, even in a context where ICTs are not prevalent in the workplace or in everyday life, is positively associated with employability.

This association suggests several strategies for development programs focusing on employment. For example, the five “advanced Internet skills” that are associated with employment do not require lengthy and expensive training to develop. These five skills include 1) using e-mail, 2) buying products online, 3) searching for a job online, 4) searching for school or training online, and 5) using online banking. E-mail and searching are skills that require little technical skill (as opposed, to, say, Web development skills or programming), and they can be folded into other kinds of ICT training programs. This finding also suggests that using the Internet, particularly for basic online activities like surfing, searching, and e-mailing, could potentially affect a person’s ability to secure a job. Thus, not only could brief and basic training opportunities possibly affect employability, but even simply using technologies in an occasional, exploratory way could have some positive effect on employability. Perhaps the most interesting implication of this analysis, however, is the level of positive association between ICT skills and employment even in a context of overall low ICT use. As we discussed earlier in the article, overall Internet usage in Kazakhstan remains low (12% in 2007 and 18.6% in 2008). In the next section, we present Internet users as a component of the larger population and identify characteristics that help to predict whether an individual will gain advanced ICT skills.

## Internet Users in the General Population

*Finding: People who are more likely to use the Internet in Kazakhstan are more educated, younger, wealthier, more urban, and more likely to own multiple technical devices.*

A direct logistic regression was performed with SPSS (version 13), using the Internet use variable as the outcome. To determine if Internet users were significantly different as a group from non-users, the model examined 10 predictors. Seven of the predictors were concerned with demographics: 1) age; 2) gender; 3) living in a rural versus urban location; 4) the number of years of schooling; 5) employment status (entered as a dichotomous variable), which, in this model, included self-employed *and* part-time employment (in part to account for elements of the informal economy); 6) student status (entered as a dichotomous variable); and 7) reported income (entered as a continuous variable from 1–6 in the model).<sup>1</sup> Three of the predictors were concerned with variables related to technology: 1) mobile phone ownership (entered as a dichotomous variable); 2) other technical device ownership, including CD players, DVD players, MP3 players, cassette players, and VCRs (entered as a continuous variable); and 3) the ability to speak and read English, which is a common language used on the Internet (entered as a dichotomous variable). Ninety cases with missing values were excluded from the model, which left 910 respondents for evaluation. Of the remaining 910 respondents, 165 (18%) reported being Internet users. Correlations between the variables are shown in Table 5.

A test of the full model with the set of predictors against the null model with no predictors was significant:  $\chi^2(10, N = 910) = 257.93, p < .001$ , Nagelkerke  $R^2 = .403$ , indicating that the set of predictors reliably distinguishes between individuals who used the Internet and those who did not. The approximate variance in predicting Internet use accounted for by the set of predictors is 40%. The classification table shows 95% of respondents who do not use the Internet were predicted correctly (model specificity); however, only 39% of respon-

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1. While reported income was technically an ordinal variable (which included six ranges of income), it was entered into the model as continuous because 1) the variable was normally distributed and the median was equal to the mean, and 2) the model outcome did not change when the variable was coded into vectors.

Table 5. Correlations between variables in the model.

	<b>M</b>	<b>Spread</b>	<b>n</b>	<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>	<b>7.</b>	<b>8.</b>	<b>9.</b>	<b>10.</b>	<b>11.</b>
1. Internet use	0.0	[18%]	910	—										
2. Age	40.4	(15.99)	910	-0.3*	—									
3. Gender	0.0	[45%]	910	0.05	-0	—								
4. Schooling	11.7	(2.69)	910	0.32*	-0.2*	-0	—							
5. Rural	0.0	[44%]	910	-0.2*	0.04*	0.03	-0.2*	—						
6. Employed	1.0	[59%]	910	0.1*	-0.1*	0.21*	0.34*	-0.1*	—					
7. Student	0.0	[8%]	910	0.15*	-0.4*	0.01	-0.1*	-0	-0.4*	—				
8. Monthly income	4.0	(0.90)	910	0.29*	-0.2*	0.04	0.34*	-0.3*	0.21*	0	—			
9. Mobile phone	1.0	[66%]	910	0.27*	-0.4*	0.02	0.36*	-0.3*	0.32*	0.1*	0.4*	—		
10. Other tech	1.1	(0.95)	910	0.25*	-0.3*	0.03	0.21*	-0.1*	0.16*	0.1*	0.3*	0.3*	—	
11. English	0.0	[7%]	910	0.24*	-0.3*	0	0.1*	-0.1*	-0	0.3*	0.2*	0.1*	0.14*	—

Notes. In the M column, means are reported here for continuous variables: age, number of years of schooling and number of other technologies owned. Modes are reported for dichotomous variables: gender, rural versus urban, employed, student status, mobile phone ownership and ability to speak English. The median is reported for reported income; however, the mean was equivalent to the median. Schooling represents the number of years of formal education. Rural represents rural versus urban, where rural was coded 1 and urban was coded 0. Gender was coded 0 female, 1 male. In the Spread column, parenthetical values are Standard Deviation (SD), and bracket values [%] are percentages of respondents coded 1 in the sample.

\*  $p < .05$ .

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Table 6. Classification table predicting Internet use.

	Predicted		Percentage Correct
	Do not use Internet	Use Internet	
Do not use the Internet	709	36	95.1%
Use the Internet	101	64	38.8%
The cut value is .500		Total (hit rate)	84.9%

Table 7. Multiple logistic regression predicting Internet use.

	$\chi^2_{(10)}$	Nagelkerke $R^2$	<i>b</i>	(SE)	Wald(1)	exp( <i>b</i> )	95%	CI
Model	257.93	.40						
Intercept			-5.32	(0.91)	34.36*	0.00		
Age			-0.06	(0.01)	31.68*	0.94	0.92	0.96
Gender			0.33	(0.21)	2.37	0.72	0.47	1.09
Schooling			0.36	(0.05)	52.55	1.43	1.30	1.58
Rural			-0.68	(0.24)	7.89*	1.98	1.23	3.19
Employed			0.13	(0.29)	0.20	0.88	0.49	1.56
Student			0.60	(0.41)	2.15	0.55	0.25	1.22
Monthly income			0.47	(0.13)	12.20*	1.60	1.23	2.08
Mobile phone			0.56	(0.36)	2.50	0.57	0.28	1.14
Other tech			0.26	(0.11)	5.84*	1.30	1.05	1.61
English			0.60	(0.33)	3.28	0.55	0.29	1.05

Note. *N* = 910.

\* *p* < .05.

dents who used the Internet were predicted correctly (model sensitivity), with an overall hit rate of 85% (which is a slight improvement of the null model's hit rate of 82%). See Table 6.

According to the Wald criterion, five variables reliably predicted Internet use, listed here in descending order of influence: 1) years of schooling, 2) age, 3) monthly income, 4) living in an urban location, and 5) owning technical devices. See Table 7.

The model predicted a probability of Internet use at 6.5%, holding all variables at their mean, mode, or median. In other words, if a respondent was of average age (39.7 years), had 11.7 years of schooling, was female, lived in an urban location, reported a monthly income in range 4 (\$201–\$500), owned a mobile phone and approximately one other technical device, was employed but was not a student, and did not speak English, the model would predict a probability of using the Internet at 11.4%.

The number of years of schooling was the most reliable predictor of Internet use: *b* = .36, *SE* = .05,

Wald (1) = 52.55, *p* < .001. The mean years of schooling in the model population was 11.69 years (SD = 2.69). If respondents scored one standard deviation above the mean (14.38 years of schooling), then they had an approximately 14.0% greater probability of using the Internet; scoring one standard deviation under the mean (9.00 years) resulted in 6.8% decreased probability, holding all other variables constant at their mean (or median/mode). Age was the next most reliable predictor of Internet use: *b* = -.06, *SE* = .01, Wald (1) = 31.68, *p* < .001. The mean age in the model population was 40.4 years (SD = 15.9). Respondents who scored one standard deviation above the mean (56.3 years) had approximately 6.6% decreased probability of using the Internet; scoring one standard deviation under the mean (24.4 years) resulted in a 13.7% greater probability of using the Internet, holding all other variables constant at their mean (or mode/median).

Monthly income also reliably predicted Internet use: *b* = .470, *SE* = .14, Wald (1) = 12.20,

$p < .001$ . The median (and mean) monthly income bracket was in range 4 (between \$201–500). Respondents who were one income bracket above the median (range 5, \$501–1000 monthly) had a 5.7% increased probability of using the Internet; reporting income at one bracket below the median (range 3, \$101–200 monthly) resulted in a 4.0% decreased probability of using the Internet, holding all other variables constant at their mean (or mode).

Living in an urban location also reliably predicted Internet use:  $b = -.68$ ,  $SE = .24$ ,  $Wald(1) = 7.89$ ,  $p < .05$ . A majority of Internet users (78%) lived in an urban location, compared to non-users, where only 51% lived in an urban location.

Finally, the number of technical devices owned (other than mobile phones or computers) reliably predicted Internet use:  $b = .26$ ,  $SE = .11$ ,  $Wald(1) = 5.84$ ,  $p < .05$ . The average Internet user owned 1.5 devices, while the average non-user owned .9 devices.

In summation, this model shows Internet users to be more educated, younger, wealthier, more urban, and more likely to own technical devices than their non-Internet-using counterparts. Considered alongside the first finding, these results have some interesting associations with employability: specifically, they highlight the importance of education. Education was the most significant predictor of employment *and* Internet use; additionally, Internet use is a significant predictor of employment in our model. This suggests that the most impactful thing a person can do to improve employability is to increase education. Our logistic regression model indicates that increasing the years of education by three or fewer years beyond the average increases a person's probability of employment by 12% and the probability of Internet use by 14%. This is additionally relevant to employability because Internet use is also positively associated with increased employability.

## ICT Usage and Earned Income

*Finding: Computer use at work has a statistically significant association with increased pay.*

Respondents used computers in approximately 31% of full-time jobs, and the Internet in approxi-

mately 13% of full-time jobs. There is a significant association between computer use at work and income among full-time employees:  $\chi^2(4, N = 500) = 53.04$ ,  $p < .001$ ; see Figure 1.<sup>2</sup> This association suggests that jobs requiring ICT skills pay better than those that do not require these skills. There is also significant association between using the Internet at work and income,  $\chi^2(4, N = 461) = 46.43$ ,  $p < .001$ .<sup>3</sup> See Figure 1 below.

While years of schooling, gender, and ICT skills were important to employability and earned income, our model included all job sectors, including agriculture and others that do not typically make extensive use of ICT skills. To investigate this further, then, we analyzed sectors separately, examining demographics, common job titles, use of computers or the Internet at work, and the average income of the workers. See Table 8 for a summary.

Almost all sectors (with the exception of industry/business) reported an income median of 4.0; therefore, we also analyzed the mean to determine a finer differentiation between reported sector incomes. Working in the agriculture sector resulted in the lowest reported mean income ( $M = 3.6$ ) compared to the overall sample, which included all respondents ( $M = 4.0$ ). Working in the business and industry sector resulted in the highest reported level of income ( $M = 4.7$ , median = 5) compared to the overall sample, which included all respondents.

Figure 1 dramatically illustrates a high association between a job that involves computer or Internet use and income: the more respondents used a computer at work, the higher the associated income. Considered in connection with previous findings, this strongly argues for development programs that help community members to develop basic ICT skills as a promising way of increasing their incomes. However, it should be expected that, as basic ICT skills become commonplace in a given community, the association between basic ICT skills and increased income will diminish, and more sophisticated levels of ICT skills will be associated with higher income. It is also interesting to note that, in our model, *computer use* was not a reliable predictor of employment; however, *Internet use* was, even though both result in higher incomes across multiple

2. These calculations include only those that 1) reported income and 2) did not report an income in the bottom range (less than \$50 a month), because only three respondents who were employed full-time reported income in this range.

3. Note that the respondents were asked if they used a computer or Internet at work, not if they used the computer or Internet for work.

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Table 8. Summary of sector analysis.

Sector	Respondents	Income Mean*	Income Median	Education Mean	Mean Age	Computer Use at work	Internet Use at work
Agriculture	45	3.6	4.0	10.9	39.5	7%	0%
Industry or Business	45	4.7	5.0	13.0	38.6	40%	30%
Government	13	4.3	4.0	14.7	37.3	85%	50%
Service	319	4.2	4.0	12.1	37.8	24%	10%
Medical	24	4.2	4.0	13.4	41.3	42%	18%
Education	46	4.2	4.0	14.7	41.2	63%	32%
Construction	17	4.2	4.0	11.4	37.7	12%	0%
State Institutions	23	3.7	4.0	13.1	40.3	52%	18%
Other	11	—	—	—	—	—	—
Employed Part-time	47	4.1	4.0	12.5	39.1	32%	9%
Not Employed	410	3.8	4.0	10.7	41.3	—	—
Total	1,000	4.0	4.0	11.7	39.7	—	—

\*Income was reported for Household monthly income in ordinal increments in U.S. Dollars, where 1 = below \$50.00, 2 = \$51.00–\$100.00, 3 = \$101.00–200.00, 4 = \$201.00–\$500.00, 5 = \$501.00–\$1000.00, and 6 = \$1001.00 or more. Mean income for the whole sample was 4.0, and median income was 4.0.

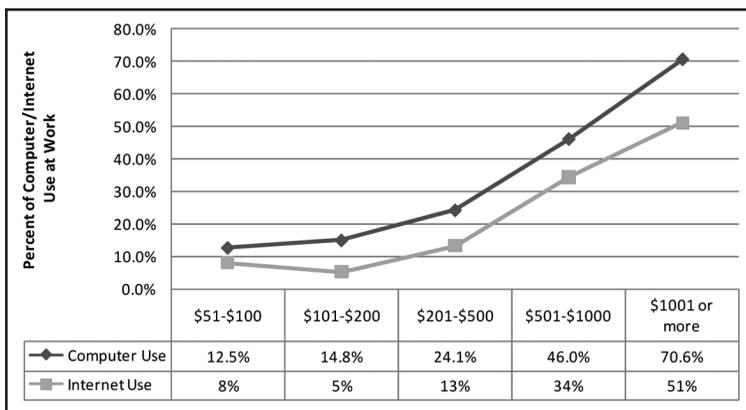


Figure 1. Income and Internet use and computer use at work in survey sample for Kazakhstan 2008.

sectors. Viewed broadly, though, the benefit is clear: ICT skills are strongly associated with full-time employment and higher-paying employment.

The sector of employment is also important in this analysis. As Figures 2 and 3 show, different employment sectors use computers and the Internet at different rates. In Figure 2, we see that computer use by sector follows some predictable patterns with lower usage rates in construction and agriculture. However, the graph clearly indicates that computer use at work is associated with middle to high in-

come ranges; it is only in the state institution sector that any workplace computer users report in the low income range. In Figure 3, both the agriculture and construction sectors were omitted from the graph because no Internet use in the workplace was reported. All workplace Internet users report incomes in the middle or high ranges.

Our desire to better understand the nuances of skill set acquisition and its association with employment across sectors led us to conduct a qualitative inquiry into one sector and to analyze

our data to determine what ICT skills actually look like in the workplace. We analyzed interview data from 18 employees at Kazakh Air. These interviews involved full-time employees on the cutting edge of technology usage in Kazakhstan at the time of the interviews. Interview findings are presented below, providing a more detailed view of how one group of technology-savvy, full-time employees in a transitioning country actually used ICTs, both on the job and at home.

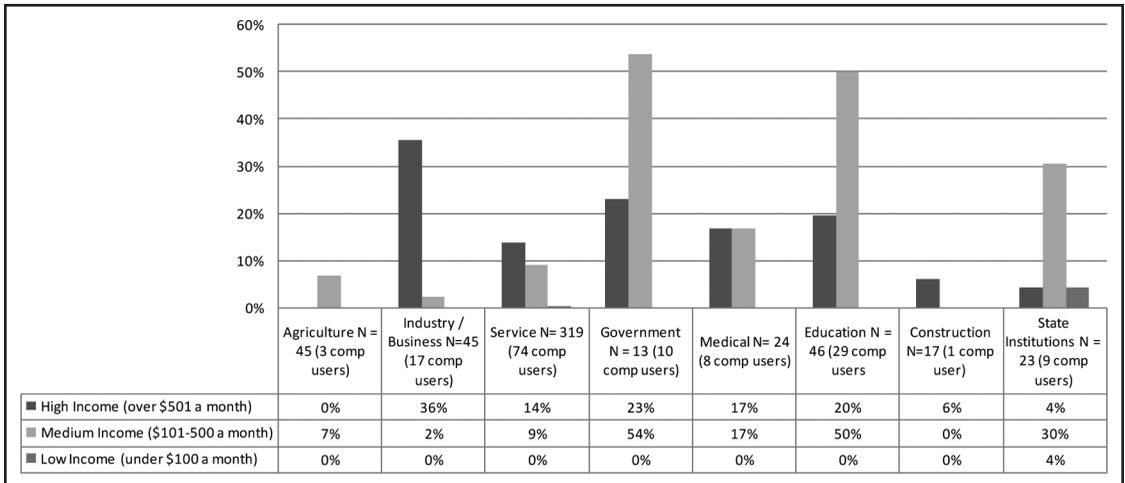


Figure 2. Computer users (reported computer use at work) in each sector by income.

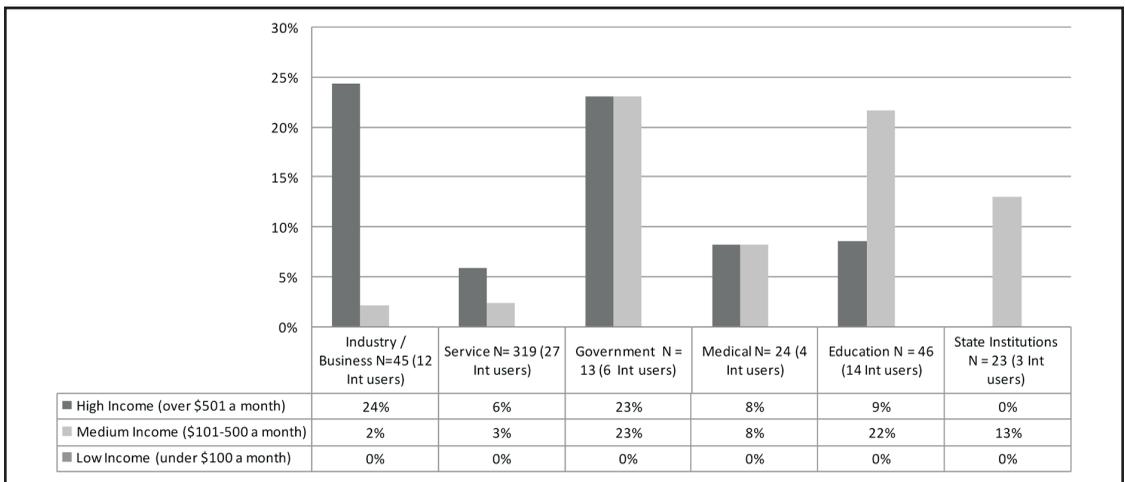


Figure 3. Internet users (reported Internet use at work) in each sector by income.

## Gaining Experience with ICTs

*Finding: Employees were among the earliest ICT users in their country.*

At the time of the interviews, all interviewees had been using ICTs for several years, many having first used computers and accessed the Internet at school or university:

“We learned to use computer at school. We had a special subject called Programming. That’s when I first used it, about 17 years ago. I used [the] Internet for the first time in the university in 1995. I searched [the] Internet for materials for my course papers and diploma.”

“We learned what a computer was and were taught to use it at school in [the] 1980s when we were in high school already. I used Internet for the first time when I was at the Aviation University about 15 years ago.”

“I first used computers in school. And I first used Internet at university because our university has requirements to use Internet sources, so much of our research and work depended directly on Internet sources.”

By 1999, all 18 interviewees had used a computer—a third of them since the 1980s. Internet use was similarly early, with 13 interviewees accessing the Internet by 1999 and all 18 interviewees online

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by 2002. This early usage was far outside the norm in Kazakhstan. In 2002, only 1.68% of the Kazakh population had used the Internet (International Telecommunications Union, 2009); thus, interviewees were among the earliest Internet users in their nation.

This finding has several interesting implications for increasing employability. For example, it bolsters other findings' emphasis on the benefits of education. Most interviewees first used a computer and first accessed the Internet at school, often at university, providing a logical explanation for the association between Internet usage and education found in the survey and reported in the statistical analysis. Further, this finding illustrates that every interviewee was online before more than 98% of the national population—and every interviewee was among the early hires of a large joint venture company providing reliable professional employment, suggesting that the company sought to hire people who were comfortable and familiar with technology.

## Mobile Phone Usage

*Finding: Most mobile phones are personal phones, but they are used largely for work purposes.*

Every interviewee who was asked about mobile phone usage owned a mobile phone (17 of the 18 interviewees), and most of them set the phone on the table in front of them during the interviews, prompting mobile-related questioning. Of the 17 interviewees who said that they had a mobile phone, the majority (11) of them had a personal mobile phone, two had both work and personal mobile phones, one had only a mobile phone for work and three people said they used their mobile phones for work without specifying whether the phones were funded personally or by work. In total, 15 of the interviewees reported using their phones for work, many using it primarily for work-related instead of personal calls. Of the 10 people who specified how long they had owned a mobile phone, eight had been using mobile phones for five years or longer—since 2000 or before.

Although mobile phone use is increasing rapidly in Kazakhstan (94% compound annual growth rate from 2000 to 2005), the interviewees were among the earliest users of this technology in their region. When the interviews occurred in 2005, there were 5.4 million mobile subscribers in Kazakhstan, repre-

senting 36% of the population. However, at least eight interviewees had owned a mobile phone since 2000 or earlier. In 2000, only 1.3% of the population in Kazakhstan owned a mobile phone, making these interviewees some of the earliest mobile technology users in their nation (International Telecommunications Union, 2009). This finding further strengthens the argument that people who are early ICT users are more likely than their non-ICT-using counterparts to work more professional, higher wage jobs.

## ICT Usage at Work

*Finding: Computer use at work is ubiquitous and constant, though the level of technical skill is not necessarily high.*

Fifteen of the 18 employees said that their computer was always on and/or always in use during the workday, and employees used a variety of software—from airline-specific collaborative software to common products such as the Microsoft Office suite. For example, employees in the mechanics department used Russell Adams Enterprise Software to manage aircraft service and maintenance, Crystal Reports to report service data, AIMS (airline information management system), and Microsoft Office products. Employees in the finance department used Sun Systems accounting software, as well as Mercury business management software, payroll software, and Microsoft Excel. Training department employees used the Internet to look up standards information for both training and reporting. Several employees reported receiving training after they were hired to learn industry-specific ICTs.

While computer use was common across departments and consistent all day, Internet use varied, depending on the task and current workload. Interviewees said that they used the Internet primarily to check e-mail and seek specific information. Estimates of Internet use varied from 20 minutes per day to all day, with use estimates increasing significantly when e-mail was included.

Interviewees unanimously said that they coordinate or communicate with other employees, and most cited technology-mediated communications both inside and outside the company:

“We use e-mail a lot, sending requests, orders, solving problems. It makes life easier; sometimes we even send e-mails to colleagues on different floors.

Phones are always busy and e-mails are more available. And [the] Internet is just essential.”

“I must interact with colleagues for 24 hours a day. . . . I communicate with professionals who perform not the same but similar job in other companies. We talk via Internet or by phone.”

“There are 20 people in our department. I have to interact with all of them during the day. Sometimes, to fulfill my duties, I can just work on my computer. . . . There are a number of [Kazakh Air] former employees who work in other companies. When questions arise in the process of work, we communicate with each other via e-mail and phones.”

“Communication with colleagues is necessary for me. Communication is actually our work. . . . I communicate with colleagues in other companies via e-mail and by phone. We also have a special aviation communication service. It functions electronically but not via Internet. It is a special internal aviation communication service; it works all over the world.”

One of the interesting implications of this finding is that these cutting-edge technology users employ commonly available software like Microsoft Office and industry-specific software for which they were trained after hire. Thus, employees were not required to be experts in all workplace technologies to secure their jobs; they had to be familiar and comfortable with computers and able to learn more specific ICT skills on the job. Further, their use of computer technologies largely facilitated person-to-person communication—again, using basic technologies like e-mail or specific systems for which they were trained after being hired. This supports the argument that basic ICT skills like e-mail use and Internet search can have a significant impact on employability. It suggests that the level of ICT skill required to affect employability is simply a familiarity with ICTs and the ability to learn specific skills in professional training.

## ICT Usage Outside of Work

*Finding: ICTs are used for personal reasons as well as for work, though the majority of time spent on computers—both online and off—is for work.*

Fourteen interviewees had a personal e-mail account, though one said that she uses the personal account only for professional communication when traveling, not for personal communications. Two

other interviewees use their work e-mail accounts for personal reasons, and one interviewee said that she uses e-mail to contact friends but she did not specify whether she uses a work or personal account. Thus, all but two interviewees use e-mail for personal reasons such as communicating with friends, and more than two-thirds use personal accounts created for this purpose.

Similarly, most interviewees (10 of the total 18) accessed the Internet from home, though two said they must bring home a work laptop to do so and that they only bring home the laptop approximately once a week. Of the seven interviewees who did not access the Internet from home, reasons vary, but answers commonly associated with developing or transition economies were never mentioned—such as unavailability of access, high cost, or a lack of familiarity with the process or technology. One interviewee said that she had Internet access at home until recently but chose to discontinue access because she did not want her daughter on the Internet. Similarly, one of the interviewees who brings home a laptop from work also explained that she does not have a personal computer to prevent her children from going online. Other interviewees said that they do not need to get Internet access at home because they can use their work connection: “No, it is not necessary [to have Internet access at home]. I can use the computers here [at work].”

Though the majority of interviewees used ICTs for personal or social purposes, the proportion of personal versus work use greatly favors work. Estimates of time spent on computers outside of work varied widely, with estimates as high as five hours per week to as low as never. Six interviewees said that they do not use computers at all outside of work, and two interviewees said they spend two hours per week on personal use. All other estimates varied: 3–4 hours per week, 5 hours per week, once a week, twice a week, 1 hour per day, rarely, twice a month, etc.

Compared to estimates of computer use at work—almost all interviewees used computers all day at work—estimates of computer use for personal reasons are significantly lower. A common reason for limited personal computer use is that interviewees spend so much time at work and use ICTs so much at work:

“Officially, I have two days off a week. However,

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in reality, it turns out to one or half a day off a week, so no time for home computer is left.”

“Not often, very rarely [do I use my personal computer] because I come home very late at night, sometimes around 10 P.M. I just have a bath and go to sleep.”

“Not a lot [of time on my personal computer]. I do too much here.”

“I bring home our company’s laptop if I need. I just think that I have enough of computer and Internet at work.”

In summary, interviewees used their computers all day at work, but many did not use ICTs very often outside of work. This finding suggests that early users of ICTs are not necessarily “technology geeks,” who secured good professional jobs because they love technology. This has encouraging implications for ICT training programs designed to increase employability: Trainees need not consider themselves technologists or even use technologies extensively on their personal time to get the benefit of increased employability. This finding contributes to the theme that in countries like Kazakhstan, a basic level of comfort and skill with ICTs is associated with increased employability. Indeed, this finding shows that the earliest Internet and mobile users in the nation with professional jobs at a large joint-venture company do not spend significant amounts of their personal time online.

## Job Status in Society

*Finding: Job status is considered high across all departments and levels represented.*

Seventeen interviewees were asked to give their opinion of their job status in society, resulting in a clear pattern of positive answers. The most common answer (9) was that their status was considered high or important:

“The status is high to my mind. It is considered a good profession.”

“I think my job is considered a prestigious one.”

“The status is higher than average.”

“It’s a good job. It’s a good level. To be a financial analyst, to be a senior financial analyst, it’s a good level, actually.”

Three people said that the status of their job was higher than it used to be and indicated that more people in society are beginning to realize the value of their profession:

“It is hard to say. Our society just starts to realize the necessity of professional accountants and auditors. The value is closely connected with this realization.”

“Previously, the profession of an engineer wasn’t popular, but now it has become respected. People know that engineers are good professionals.”

Of the other five opinions, two people said that society considered their job status to be interesting, and the three remaining interviewees provided unique answers: 1) the status is mid-level; 2) the interviewee does not care what society thinks of her profession because she likes it and that is all that matters; 3) her job status is completely unknown because people do not know what she does.

The patterns of answers clearly indicate that the interviewees consider their job status to be high, and this suggests that they believe they have good jobs. The prestige associated with their field or their company partly explains why interviewees are willing to work the long hours described elsewhere in the interviews and to learn how to use new technologies.

Another theme that is clear from these answers is that interviewees’ fields are new to their society. Considered alongside technology usage patterns, this theme suggests that interviewees represent a group of people leading several growing trends in their society: mobile phone use, computer literacy, Internet use, and career choice.

## Conclusions

While ICT skills do predict employment and are strongly associated with higher-paying jobs, the level of ICT skill associated with these jobs is not as high as one might expect. Skills that are considered basic computer literacy in the developed world—using Microsoft Office products, e-mailing, searching online for information—appear to be sufficient to attain high-prestige jobs when combined with other factors such as higher education. These findings suggest areas of future study to further develop a picture of the relationship between ICT skills and employment. The data in this article uses Kazakhstan as a case study to explore ICT skills and employability. As a nation with a transitioning economy, Kazakhstan provides an interesting example, but future work using data from other countries—particularly those in developing nations—could pro-

vide additional information to support ICTD efforts. These future efforts would shed more light on the variations of factors associated with employment and the levels and areas of ICT skill that are relevant to employability.

This exploratory study has sought to disambiguate some of the variables that are often confounded in examining ICT use and employability, including education, foreign language knowledge, and living in an urban area. While our statistical work here is exploratory in nature, further analyses using sequential regression could help to determine the size of the effect technology use has on employment after accounting for demographic variables. Providing ICT training can be expensive and time-consuming, and models to provide such training in an economically sustainable manner are rare. Consequently, it is crucial to better understand the social and economic benefit to providing such training before more and wider training efforts are launched. Research that helps us see causation in the connection between individuals acquiring ICT skills and then acquiring jobs is one of the important next steps in this research area. ■

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