



## ICT ADOPTION MODEL – APPLICABILITY TO CRISIS PERIOD

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### **Abstract**

The model recently validated by Ulmanis [1], suggests that decisions by managers/businesses to adopt or intensify the use of ICT are made as the result of a balance of factors. These factors are divided into two large components: objective and managerial. When these factors are considered they lead managers to make positive (or negative) decisions to adopt or intensify the use of ICT. During the international financial crisis (2008- 2012) both sets of factors would seem to predict that at best firms would stay static in their use and adoption of new ICT tools. To test this we surveyed 97 MBA students. Of the 97, 35 work for companies with more than 250 employees. Given that average firm size in LV is 10 employees [2], this suggests that the results are particularly applicable to the biggest firms in Latvia. The survey was in the form of a five point Likert scale. There were 4 categorical questions and a total of 41 items contained across the 4 questions. The 4 questions and contained 41 items were combined in a construct called *ICT Practice Change*. The items were coded for no change, some change, or significant change and compared in firms reporting high ICT use, medium use or low use. Using SPSS, an Item Response Theory model [3] was created by which to test the responses. Overall, there were no significant changes in use of ICT reported by Latvian firms. Intergroup (comparing high with medium or low for example) did show that high use groups reported significantly more changes than did low intensity use groups, but still the intensity of use did not change from 2008-2011. Generally, it can be stated that ICT use has changed very little in the time period 2008-2011. For all the variables the conclusion is that their importance was somewhat increased. This suggests that the prediction based on the model is accurate. This lends further support to the validity of the model.

### **Introduction**

Information and Communication Technologies (ICTs) have largely transformed the way business approaches most aspects of their operations. The productivity gains created through use of these ever evolving tools are significant [4], [5]. These gains have enabled considerable changes in process creation, standardization and development. Among the improvements enabled by the expanded use of ICTs are reductions in labour costs, increased proximity to customers and standardized products and brands [6]. Previous work aimed at understanding how



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ICT is adopted, diffuses and intensifies and, finally, how it benefits firms and economies has largely relied on studies done in developed countries [7],[8]. Research in firms in emerging economies, where the opportunities based on economies of scale are less apparent, have shown less evidence of productivity gains [9], [11], [12], [13].

Some research has suggested that adopters (managers or others) to do not always behave in an objective manner. The author has recently developed and validated a model (Figure 1) [1] showing that decisions to adopt and use ICT are made in a consistent fashion by firms in Latvia. The model shows that these decisions are made in a similar fashion independent of firm size or industry. The model suggests a decision making process combining both objective component factors and managerial component factors. The interaction of these factors leads to decisions that reflect managers' reactions to both the managerial and external environments.

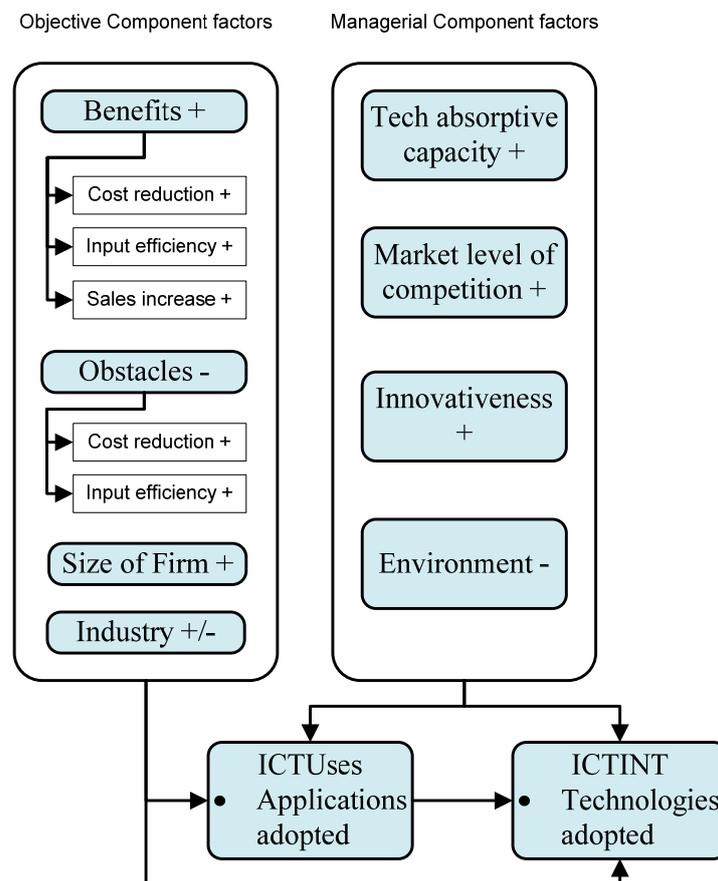


Figure 1. Adoption Model

The overall objective of strategies to increase the likelihood of use of ICT has been to contribute to the diffusion and adoption of ICTs but little is understood of how specific



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circumstances of companies in developing countries need to be considered in order to take advantage of the benefits offered by ICTs [14]. This phenomenon is present in Latvia perhaps not in an absolute way, as clearly an infrastructure and use of ICTs are present to a considerable degree as the study shows. Nevertheless, the digital divide does exist in more subtle ways that are revealed by how much these ICTs are used and for what purposes. At the same time, the controversy regarding the effect of ICTs on productivity and economic growth signaled that there was a significant gap between strategies and policy statements and empirical practice [15], [16]. In the context of the global financial crisis, this suggests a need to understand whether current strategies are either working or failing at encouraging companies in a struggling economy to use ICT and use it more deeply.

In the course of doing the extensive work done to create the adoption model, a question arose regarding whether the global financial crisis that began in 2008 had impacted the diffusion and use of ICT in firms in Latvia. The authors' hypothesis was that the crisis had not significantly impacted the diffusion of ICT in Latvian businesses. This paper presents the results of a survey done to determine whether the crisis has impacted the diffusion and use of ICT on/in businesses in Latvia. Further, the model would suggest that the factors leading to positive adoption decisions most likely would not be attended to and so few or fewer positive adoption decisions would be made.

## Materials and Methods

In order to ascertain whether ICT use in Latvian businesses had undergone real or significant change since 2008, a survey of managers was done. The managers were all MBA students taking summer classes during the summer of 2011 at RTU Riga Business School. The survey was distributed to 120 students and 97 completed surveys were returned. The surveys were coded into an Excel spreadsheet and subjected to statistical analysis using the SPSS package as discussed below.

The survey consisted of a total of 8 questions with sub-questions to understand the specific category of ICT being asked about. The first 5 questions asked about the firm's attitude toward ICT and its use and the other three were descriptive. They were:

1. The importance of ICT use (how it has changed);
2. How ICT efficiency benefit goals have changed;
3. How obstacle to investments in software and hardware have changed (at firm level);
4. How ICT absorption methods have changed.

The attitudinal questions asked about general attitudes about ICT and each was divided into items that asked about specific reasons or specific types of technology: For example the first general question was:

*How has the importance of ICT in your business activity changed since the economic crisis beginning in 2008 in the following aspects of the work of the firm where you work?*

The question was followed by items that asked about specific business areas:

1. In promoting competitiveness;
2. Overall efficiency;
3. Increasing market share;



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4. Improving business processes;
5. Decreasing costs;
6. Improving collaboration;
7. Improving use of online processes;
8. Online HR process management and planning of online production and inventory management processes;
9. Increasing the number of customers in new markets;
10. Increasing the number of clients in existing markets.

The scale was:

1. Significantly decreased;
2. Decreased;
3. Unchanged;
4. Increased;
5. Increased significantly.

Descriptive information was tabulated and attitudinal questions were grouped. There were 4 categorical questions and a total of 41 items contained across the 4 questions. The 4 questions contained 41 items were combined in a construct called *ICT Practice Change*. The items were coded for no change, some change, or significant change and compared in firms reporting high ICT use, medium use or low use. Using SPSS, an Item Response Theory model [3] was created by which to test the responses.

Each item was first transformed as follows: no change is given a score of zero, increase or decrease a score of 1 and strong increase or decrease a score of 2. This approach recognizes that change, either increasing or decreasing use, matters – rather than having a decrease cancel out an increase and then claiming there is no change.

## Results

As can be expected from MBA students, most (60) said that they were middle level managers. Of the rest, 11 each were high level and low level managers, with the other 15 having administrative or technical tasks. The largest proportion worked in financial services (29%), followed by 17.5% in services and 15% in ICT or communications. 36.1% of respondents worked in bigger (250 employees) firms and the rest were nearly equally distributed in smaller companies. This division is not absolutely consistent with the division of LV employment but does reflect a group of managers who could be expected to have knowledge of ICT and its use in firms that might use ICT in a sophisticated way.

The final descriptive question asked about the general intensity/sophistication of use of ICT in the firm the respondent works in. The question characterized the use as Low (use email and internet), Medium (plus use of online purchasing and/or intranet) and High (use of sophisticated CRM tools such as SAP or Oracle). The largest fraction (46.4%) worked in firms using ICT in a sophisticated fashion and only 15% reported low sophistication. As almost might be expected, the largest firms reported the highest use of technology; 69% of those in larger firms reported high intensity, in contrast to only 41% in the next smaller group. Figure 2 shows these results.

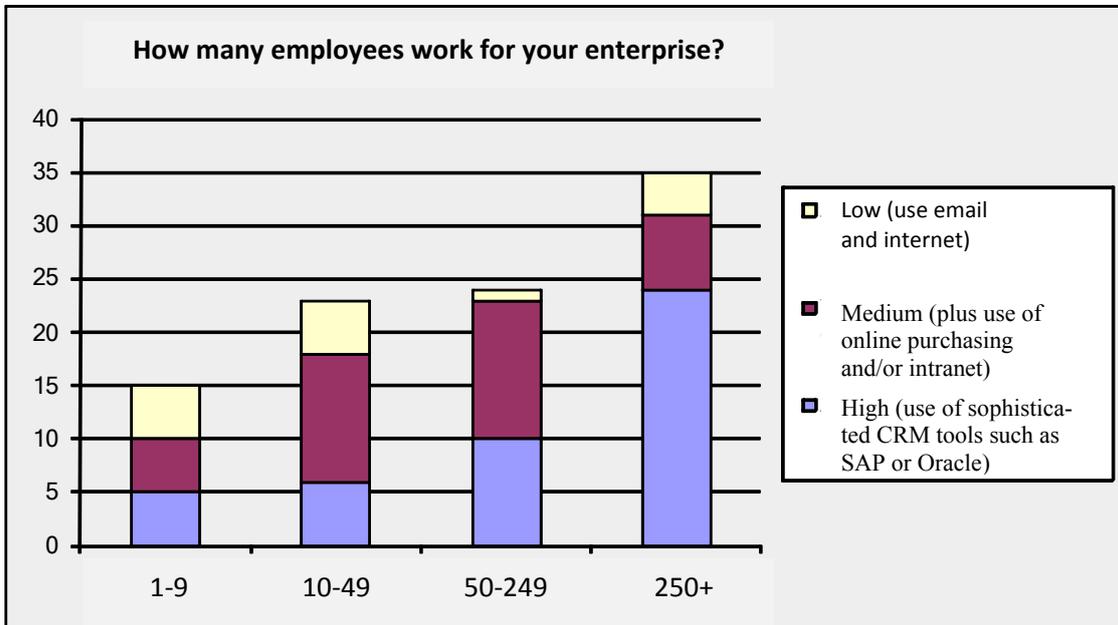


Figure 2. General intensity/sophistication of use of ICT in the firm

Table 1 shows the results of this overall construct of change in IT practices. The regression coefficients show the difference in the means for medium and high against the low category (hence the zero mean for low). Overall, the mean for the medium group is 0.606 higher than the mean for the low group. Conversely, the mean for the high group is 0.751 higher than the low group. Only the latter is statistically significant – i.e., they report more change – but given the relatively small difference between the two coefficients, the medium group is fairly close to the significance threshold.

Table 1

Q1 – 11 Categories

Q8 Group	Regression Coefficient	Sample Mean	Equivalence	
			Mild Increase or Decrease	Strong Increase or Decrease
Low	0.000 (0.000)	-0.004 (1.983)	0.3	0.2
Medium	0.982 (0.405) ≡	1.008 (1.062)	0.6	0.3
High	1.322 (0.396) ≡	1.316 (1.602)	0.7	0.3
<b>Total</b>		<b>0.988 (1.540)</b>	<b>0.6</b>	<b>0.3</b>

The table also shows the means across the three groups as well as the overall mean. These means have very little direct connection to the original responses. An explanation is contained in the “Equivalence” columns. For example, the number 0.3 under “Mild Increase or Decrease” for the low group could be interpreted as companies reporting one third of a mild change on



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each item, or a mild change on one third of the items. This does not appear to be a real change. The number of 0.2 under the “Strong Increase of Decrease” would represent strong change in one fifth of the items, with all other items reporting no change. Put another way, if one were to find the number 1.0 in the “Mild Increase or Decrease” column, this would obviously mean that companies reported, on average, a mild change in all items. A 1.0 in the “Strong Increase or Decrease” column would mean reporting a strong change in all items on average.

The next tables go through each individual question, Q1 to Q4, each as their own constructs. The first two – Q1 & Q2 – are the only ones showing significant differences in reporting by IT groups; the other two – Q3 & Q4 – show no significant difference in reporting. The Tables are 2 and 3 and 4 below.

Table 2

## Q2 – 15 Categories

Q8 Group	Regression Coefficient	Sample Mean	Equivalence	
			Mild Increase or Decrease	Strong Increase or Decrease
Low	0.000 (0.000)	0.030 (1.549)	0.4	0.2
Medium	0.492 (0.432)	0.498 (1.348)	0.5	0.3
High	0.894 (0.426) <sup>***</sup>	0.902 (1.630)	0.6	0.3
<b>Total</b>		<b>0.607 (1.525)</b>	<b>0.6</b>	<b>0.3</b>

Table 3

## Q3 – 10 Categories

Q8 Group	Regression Coefficient	Sample Mean	Equivalence	
			Mild Increase or Decrease	Strong Increase or Decrease
Low	0.000 (0.000)	0.017 (1.312)	0.4	0.2
Medium	0.310 (0.378)	0.288 (1.476)	0.5	0.2
High	0.303 (0.372)	0.318 (1.315)	0.5	0.3
<b>Total</b>		<b>0.261 (1.370)</b>	<b>0.5</b>	<b>0.2</b>

Table 4

## Q4 – 5 Categories

Q8 Group	Regression Coefficient	Sample Mean	Equivalence	
			Mild Increase or Decrease	Strong Increase or Decrease
Low	0.000 (0.000)	0.079 (1.605)	0.6	0.3
Medium	0.204 (0.374)	0.224 (1.608)	0.7	0.3
High	0.162 (0.367)	0.205 (1.328)	0.6	0.3
<b>Total</b>		<b>0.192 (1.473)</b>	<b>0.6</b>	<b>0.3</b>



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Though the medium and high use groups do tend to report more change than the low group, none of the intensity use groups show any significant changes.

## Discussion

All of the questions reflect that, even in firms with the highest intensity of use of ICT, that there has been little or no increase in use of the technology. The results of this survey of managers in Latvia demonstrate that businesses from a range of industries and sizes have not increased their use and intensity of use of ICT during the crisis time. While the financial crisis that began in 2008 has led to significant contraction in business and businesses, it seems that it has not led firms in Latvia to do one thing that has been shown to be connected with success—invest in the adoption and intense use of ICT. These results suggest that managers and owners could see that there is a clear strategic opening to increase their use of ICT and preempt competitors while the economy is still in crisis or stagnation.

From a policy perspective, the results suggest that policy aimed at increasing the adoption and diffusion of ICT in Latvian firms has not been successful. These results serve as a benchmark for Latvian policy makers (whether in government or in other public sector areas) in measuring whether policy has any objective benefits. As the lack of change is true in all industries and firm sizes observed, the results suggest that policy makers need to either find or create policies that are effective across a range of industries and firm sizes.

These results also reinforce the importance of the adoption model that was previously validated. The analysis suggests that a more comprehensive link to growth and innovation is necessary to make ICTs adoption and usage metrics matter. While conceptually it is easy to cast a general message of technology as some sort of panacea based on random examples, in practice, the very simple indexes used internationally to compare relative development, showed to lack any power to compare the qualitative impact of the use of ICTs

The value of ICTs for Latvia should reside mainly in developing new business processes that increase the productivity and scale of its internal market and enable it to participate in international value chains with more advanced ICT users in the region, as indeed has been the tendency in response to the financial crisis. If firms in Latvia continue to ignore the opportunities afforded by the adoption and intense use of ICT, they will likely lose the opportunity to become more generally competitive.

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