ICT Adoption Policy of Australian and Croatian SMEs

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Many SMEs are currently adopting information and communication technology (ICT) and services based on it. However, there is little systematic research into how they are doing this and what are the organizational and environmental factors associated with this adoption. This article builds a model of ICT adoption in Australian and Croatian SMEs on the premise that SMEs are the main economic developing factor in all modern economies and that the adoption and the use of ICT represents a fundamental source of competitiveness and the basis for their survival on the world market. By applying both the Qualitative-comparative analysis (QCA) method and Boolean algebra, the authors developed a model of necessary and sufficient factors for ICT adoption by SMEs in Australia and Croatia.

INTRODUCTION

Over the last decade the business world has changed so rapidly that one can no longer imagine managing in a steady state. In no other domain has this observation been more relevant than in the field of information communication technology (ICT), which has become a major catalyst and enabler for organisational change. Thus, today emerging small and medium-sized enterprises (SMEs) find themselves in an environment of constant technological change. These changes may become a significant threat when ignored by the company, but they may as well become valuable opportunities when anticipated and where appropriately adopted. How those changes affect SMEs and how they respond to this challenge in Australian and Croatian SMEs is the question that we will try to answer in this paper.

Successful small and medium sized enterprises (SMEs) are recognised as being an important component of industrial development and consequent social benefits of all economies. In addition, IT/ICT has been described as altering the structure of whole industries, dampening prof-
itability and levelling business practices. SMEs are not immune to these effects and must find a way of successfully adopting this new technology. Many SMEs are currently adopting ICT; however, there is little systematic research into how they are doing this and what are the organisational and structural factors and changes associated with this adoption. This paper addresses this gap through an exploration of factors associated with this adoption.

In this article the authors develop an adoption model of ICT by applying the Qualitative-comparative analysis (QCA) method and its formal language – Boolean algebra. For setting up hypotheses the authors used five case studies from each country, while the empirical analysis was founded on fifteen case studies from each country, which is considered as a reasonable number for the QCA.

By using five case studies from both countries (Australia and Croatia), we have coded firms’ characteristics as shown in table 1. We proceed by summarising them in tables (2 for Australia and 6 for Croatia) represented by Boolean functions (functions 1, and 2 for Australia and Croatia respectively). Those functions were also presented as Boolean primitive tables (5 and 7) for both countries and were then minimised by applying Boolean logic.

Tables 5 and 7 were constructed by using qualitative attributes present (1) and absent (0) for causal variables and outcomes. It is also necessary to mention that for attributes we used binary codes, which further helped the process of transforming these tables. By applying the Boolean logic to the process of minimisation we were able to simplify them (see Skoko 2003 for the rules of the minimisation procedure). At the end of this process of minimisation we arrived to the final Boolean table of functions ($Y_{1,2,3,4,5}$) for Australia (8) and the final table of functions ($Y_{1,2,3,4}$) for Croatia (9).

The last section takes up the interpretation of results of hypothesis testing that is mapping the areas of agreement for both countries SMEs, and presents the concluding remarks.

**AUSTRALIAN CASE STUDIES**

In 2002, NOIE (www.noie.gov.au) commissioned a professional services firm Ernst & Young to identify and examine those small and medium businesses in Australia that were successfully using advanced ICT technologies. The purpose of the project was to demonstrate the business benefits of e-commerce and assist small businesses to undertake their
own cost-benefit analysis of e-commerce. The project included 34 case studies in which small businesses from a wide range of industries around Australia shared their experiences with e-commerce. Using this secondary data for fifteen comparable case studies with Croatian SMEs, we have conducted the content analysis to construct Boolean primitive tables of the Australian case studies and set the hypotheses.

**Characteristics of Australian Firms (Case Studies)**

In order to carry out an empirical analysis and apply QCA and Boolean algebra it was necessary to develop a coding system (table 1) which was than used in a further analysis to build up a Boolean primitive table of ICT adoption.

By using the above coding system we could summarise the content analysis findings (see table 2).

As we can see in table 2, the analysed firms are small and medium in size (column 2) from different industrial sectors (column 3), which were adopting ICT (column 4) mainly under the impact of technological (3×1) and environmental (2×2) essential influencing factors, while individualistic factors (1×4) played a minor role in the process.

In addition it is worth noting that small firms had low to medium investment costs (column 5) while two medium firms had significant investment costs that were over AUD 15,000.

The main form (column 6) of the adopted ICT was a designed home site (5×4), followed by the Intranet (3×3). In other words, those influencing factors lead to the introduction of computers connected to the Internet (column 6 in table 2) as well as to the designed Web presentation mainly for marketing and promotional purposes. However, none of the subjected SMEs introduced e-commerce at the time of the survey (2000) although they had planned to do it.

The most significant hurdles for businesses adopting ICT were evenly spread amongst limited human resources (column 7). These are: additional time necessary to learn the new technology and/or to answer emails and finding the right website developer. In a number of cases businesses were dissatisfied with the work of their first web developer and needed to use a second developer to get the right result.

As regards benefits (column 8), businesses that made small and medium-sized investments in e-commerce saw a higher proportion of their return coming from additional revenue while those making a large investment reaped the biggest benefit from business efficiencies. Efficiency
TABLE 1 Coding system used in the analysis of Australian SMES (case studies)

<table>
<thead>
<tr>
<th>1.0</th>
<th>2.0</th>
<th>3.0</th>
<th>4.0</th>
<th>5.0</th>
<th>6.0</th>
<th>7.0</th>
<th>8.0</th>
<th>9.0</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1</td>
<td>1</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes:
1.0 Firm
1. Aboriginal Fine Arts Galleria
2. Bonds Couriers
3. Davis Engineering
4. Linear Architects
5. Mt Coot-tha Restaurant (MCR)

2.0 Size
1. Small
2. Medium
3. Large

3.0 Activity
1. Trade
2. Other service
3. Manufacturing
4. Professional service
5. Tourism/restaurants

4.0 Idea/influence to adopt IT
1. Technological factors
2. Business environment (economic policy, competitors, and business partners)
3. Organisational factors
4. Individualistic factors (manager, staff etc.)

5.0 Investment size
1. Up to AUD 5,000
2. From AUD 5,000 to AUD 15,000
3. Over AUD 15,000

6.0 Form of IT
1. Computer
2. One computer connected to the Internet
3. Intranet and Internet
4. Home site
5. E-commerce

7.0 Problems experienced in the adoption of an IT process
1. Technical
2. Human resources
3. Financial
4. Time needed for adoption
5. Other, e.g., problems with business partners, governmental policy etc.

8.0 Results
1. Better than expected
2. Expected
3. Worse than expected

9.0 Future expectations
1. Optimistic (plans for further improvements, expansion of e-commerce etc.)
2. Pessimistic (status quo – holding the existing level of IT)

Source: Skoko 2003, 119.

Savings generally came from leveraging electronic communications, using the website as a marketing tool and the Internet to conduct financial transactions online. A combination of these efficiencies allowed some businesses to grow without having to employ more staff or to otherwise engage staff in more satisfying and profitable activities.

If these businesses had a positive experience with ICT they expand
their involvement in e-commerce in the future. These plans vary according to the level of e-commerce sophistication adopted by each business.

Based on the content analysis of the first five case studies we can set up the first hypothesis following the Boolean logic\(^2\) in an empirical form as follows:\(^3\)

\[
H_1: \quad \text{TEH}^{\text{Aust}}_{n} + x \left( \text{PP}^{\text{Aust}}_{n} + x \text{K}^{\text{Aust}}_{n} + x \text{BP}^{\text{Aust}}_{n} \right) \\
\quad \quad \text{ORG}^{\text{Aust}}_{n} + x \left( \text{M}^{\text{Aust}}_{n} + x \text{S}^{\text{Aust}}_{n} \right) \\
\quad \quad \Rightarrow \text{C}^{\text{Aust}}_{n} + x \text{CI}^{\text{Aust}}_{n} + x \text{NCI}^{\text{Aust}}_{n} + x \text{HS}^{\text{Aust}}_{n} + x \text{EC}^{\text{Aust}}_{n} \quad \quad (20)
\]

For explanation of symbols see tables 3 and 4. The above functional form can be represented as a Boolean ‘primitive table’ (see table 5).

In the following section the approach is adopted for the Croatian case studies.
### Table 4: Dependent variables (outcomes)

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning of codes</th>
<th>Code of present variables</th>
<th>Code of absent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Computer</td>
<td>Y_1</td>
<td>y_1</td>
</tr>
<tr>
<td>CI</td>
<td>One computer and Internet</td>
<td>Y_2</td>
<td>y_2</td>
</tr>
<tr>
<td>NCI</td>
<td>Intranet and Internet</td>
<td>Y_3</td>
<td>y_3</td>
</tr>
<tr>
<td>HS</td>
<td>Home site</td>
<td>Y_4</td>
<td>y_4</td>
</tr>
<tr>
<td>EC</td>
<td>E-commerce</td>
<td>Y_5</td>
<td>y_5</td>
</tr>
<tr>
<td>+/x</td>
<td>And/or</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Skoko 2003, 152.

### Table 5: Boolean primitive table of causal variables and outcomes for Australian SMEs (first five firms)

<table>
<thead>
<tr>
<th>SME</th>
<th>Causal factors (variables)</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X_1 X_2 X_3 X_4 X_5 X_6 X_7 Y_1 Y_2 Y_3 Y_4 Y_5</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 0 1 1 1 0 0 1 1 0 1 0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0 0 1 1 1 1 0 1 1 1 1 0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 0 1 1 0 1 0 1 1 0 1 0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1 0 0 1 1 0 0 1 1 0 1 0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1 0 1 1 0 0 0 1 1 0 1 0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Skoko 2003, 155.

### Croatian Case Studies

In order to conduct the same analysis for the Croatian case studies we have designed a questionnaire which was sent to 100 SMEs all around the country. 20% of SMEs responded to those questionnaires of which 5 were not usable. It is also important to note that most of the responses did not provide us with the financial structure of their businesses, while some of them asked us not to publish their contact details. Thus, by using primary sources we will here set up the second hypothesis and describe the development of an ICT adoption model for Croatia. However, before doing that we need to note the structure of the Croatian economy in transition and to emphasize those characteristics that might influence the results of our analysis.

In the past decade the macroeconomic performance of the Croatian economy has not been impressed by any standard. The proclamation of independence, the war of aggression, the policy of transition from
socially self-managed economy to a market economy, and the macro- and microeconomic mismanagement were some characteristic features of that economy. The enchantment of policy makers with textbook style liberal market philosophy has resulted in a policy of tight money control, high interest rates and unrealistically high pegged foreign exchange rate leaving little room for an economic expansion. Accordingly, the rates of growth were very low or negative, the unemployment rate was high and the prices were not stable. In addition, the balance of payment position was highly unfavourable with a mounting external and internal debt.

A decade old downward trend in the economic growth of Croatia started in the 1980s. In 1998 the GDP of Croatia was 81%. The lowest level was recorded in 1993 when it was 63%. The level of gross investment as a percentage of the GDP was as low as 11.3 in 1991 and reached a maximum of 20.6%. In 1998, according to the World Bank statistics, it was 17.6%. In 1998 the number of employed people fell from 1.57 million (1990) to 1.18 million. In 1997 the current account deficit on the balance of payment reached record levels – 2,434 million USD, while in 1998 the total external debt was around 8 billion USD. Thus, Croatian transitional economies are in the midst of an unfavourable environment for development. This stage of development is characterized by:

- adverse business settings in which the contribution of both public spending and tax burden is increasing,
- uncertain future of business,
- an ever-present threat of increased inflation,
- highlighted management problems due to an unsolved (or unsuccessfully solved) ownership system,
- lack of investment funds and financial infrastructure,
- lack of skilled labour force,
- lack of incentives for productivity and amortisation increase.

These structural characteristic of the Croatian economy highlighted the critical need for SMEs support and their further development as well as the importance of adopting and using ICT.

**Characteristics of Croatian firms (Case Studies)**

As mentioned earlier, for this part we use primary data collected by a structural questionnaire. This section is based on content analysis. By using the same coding system as in the Australian case, we have presented characteristics of Croatian SME firms.
Content analysis (table 6) shows that the analysed firms are small and medium in size (column 2), from different industrial sectors (column 3), which were adopting ICT (column 4) mainly under the impact of individualistic ($3 \times 4$), and technological ($2 \times 1$) essential influencing factors. Organizational and environmental factors played no role in the process.

In addition it is worth noting that one small firm and one medium firm had high (over AUD 15,000) investment costs (column 5), while one medium firm had small to medium high investment costs i.e. from AUD 5,000 to AUD 15,000. The main form (column 6) of adopted ICT was 3.4, which means that more than one computer (Intranet) was connected to the Internet with a well designed home site ($3 \times 3.4$), followed by one computer connected to Internet with a designed Web site (2.4), while one firm had one computer.

The most significant hurdles for businesses adopting ICT were evenly spread amongst 1, 5, 2 (column 7). These are technical problems, infrastructural issues (bad connections), limited human resources, as well as (5) problems linked to the current economic situation and lack of legislative and governmental support. In addition, several firms reported problems with business partners which have not installed any form of ICT which resulted in a poor use of their own ICT technologies.

As regards benefits (column 8), one can conclude that an even number of firms reported that the investment in ICT was a good and a bad decision. Finally, it is important to note that all firms were optimistic about the future development of ICT and are planning to extend its use and further invest in these technologies.

From the above mentioned it can be concluded that the Croatian economy is in transition and it lacks a policy for SMEs development. It was also obvious that in those firms the ICT adoption depends on initiatives of managers/owners alone.

These influencing factors led to the introduction of computers connected to the Internet (column 6 in table 6) as well as to the designed
Web presentation in most cases for marketing and promotional purposes. One small firm had one computer connected to the Internet. Two medium firms had installed both the Intranet and the Internet, while one medium firm had only one computer connected to the Internet. However, although planned, none of those firms introduced e-commerce, mainly because there were no legal and infrastructural foundations for it.

Based on these findings the second hypothesis was set that can also be presented in a form of equation and Boolean ‘primitive table’ as follows:

\[ H_2: \quad \text{TEH}_n^C + (\text{pp}_n^C + \text{pp}_n^C) + \text{org}_n^C + \text{M}_n^C + \text{hs}_n^C \Rightarrow C_n^C + \text{CI}_n^C + \text{NCI}_n^C + \text{HS}_n^C + \text{ec}_n^C \] 

For explanation of symbols see table 7.

RESULTS

Based on the process of minimization and by applying Boolean logic in this section, the results are presented as follows.\(^4\)

Firstly, Australian SMEs are adopting IT/ICT in the form of computers (C/Y\(_1\)) and Internet connections (CI/Y\(_2\)). The factors that influence the design of their home sites (HS/Y\(_3\)) are: technological factors (X\(_1\)) and government support policies (X\(_2,3,4\)), or (+) technological factors (X\(_1\)) with individualistic factors (X\(_6\)) and (\(\ast\)) in combination with organisational factors (X\(_5\)) (function Y\(_{1,2,4}\)).
The factors that influence the adoption of the Intranet (NCI/Y3) are: technological factors (X1) with (and/(*)) or without government support policies (x2*x3*x4), but with individualistic factors (X6) (function Y3); or/(+) environmental factors (X2 * X3 * X4) alone; or/(+) individualistic factors without the technological factor (X1 * X5 * X6).

Finally, the factors that influence the adoption of e-commerce are: environmental support policies (X2 * X3 * X4) with individualistic technological factors but without organisational factors (x5 * X6 + X1 * x6) or/(+) technological and individualistic factors (X1 * X6) without (*) environmental/support factors (x2 * x3 * x4) (function Y5).

Croatian results can be interpreted as for the introduction of an IT/ICT basic form – a computer (C). The main factor of influence is individualistic in combination with technological factors (X6 + X1 * x6), without government support policies and organisational factors (x2 * x3 * x4 * x5) (function Y1).

The adoption of more sophisticated forms of IT/ICT was influenced by technological factors (X1) without environmental/support policies and organisational factors (x2 * x3 * x4 * x5) (function Y2,3,4).

Finally, as regards the last step, the application of QCA process, it was necessary to devise the areas of agreement between theoretical and empirical findings, presented in table 10 (Australia) and 11 (Croatia).

From table 10 we can conclude that for adopting IT/ICT forms (C, CI, HS) it was necessary that technological factors (theoretically hypothesised) as well as environmental/government support factors (not theoretically hypothesised) were present. We have mapped only the technological factor area of agreement between the theoretical and the empirical model. For adopting higher levels of IT/ICT like Intranets, Australian SMEs would need a combination of causal conditions in the following order: the presence of technological factors and the absence of governmental support but the presence of individualistic factors. In other words, we have mapped areas of agreement for technological and individualistic factors but not for the government support. For the last IT/ICT form, e-commerce, we have confirmed the area of agreement for both individualistic and governmental support factors.
Similarly, the Croatian areas of agreement were mapped (see table 11). From table 11 we can conclude that the adoption of basic forms of IT/ICT was influenced by technological and individualistic factors. It is therefore confirmed (the area of agreement) that the adoption of IT/ICT in Croatia is not politically supported and is left to individuals with their knowledge and IT skills. Other higher forms of IT/ICT are adopted under the influence of technological factors. All other factors were absent.

**CONCLUSION**

Many smes are currently adopting the information and communication technology (ICT) and services based on it. However, there is little systematic research into how they are doing this and what are the organisational and environmental factors associated with this adoption. In this article, the authors have built a model of necessary and sufficient factors for ICT adoption by smes in Australia and Croatia by applying the Qualitative-comparative analysis (QCA) method and Boolean algebra.

By applying the QCA method rules and the logic of its formal language – Boolean algebra on two case studies (Australia and Croatia), we have found out that Australian smes are adopting ICT mainly under the influence of technological factors and government support, while Croatian smes under the influence of technological and individualistic factors. In
Table 11: Map of areas of agreement for Croatian SMEs

<table>
<thead>
<tr>
<th>Form of IT</th>
<th>Theoretical influencing factors (T)</th>
<th>Empirically confirmed influencing factors (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>TEH</td>
<td>TEH</td>
</tr>
<tr>
<td></td>
<td>env</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>org</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>IND</td>
<td>M</td>
</tr>
<tr>
<td>CI, HS, NCI</td>
<td>TEH</td>
<td>TEH</td>
</tr>
<tr>
<td></td>
<td>env</td>
<td>—</td>
</tr>
<tr>
<td></td>
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<td>—</td>
</tr>
<tr>
<td></td>
<td>IND</td>
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</tbody>
</table>

In addition, we have also confirmed that Croatia does not get environmental/political support when adopting ICT.

Notes

1 According to Ragin (1989) qualitative comparative analysis is appropriate for five to about thirty cases. Recently, Biggert (1997) suggested ten to fifty cases as a moderate number of cases.

2 For an overview of Boolean Logic see Krivokapic-Skoko 2003.

3 For full details of disaggregation of variables see Skoko 2003.

4 For a detailed use of Boolean logic see Skoko 2003.

References


