

# THE TRANSFER AND COMMERCIALISATION OF TECHNOLOGY FROM SOUTH AFRICA TO FOREIGN MARKETS IN THE FINANCIAL SERVICES INDUSTRY

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## ABSTRACT

International technology transfer (ITT) processes are complex, risky, and often fail. When financial services organisations have the opportunity to transfer their business model and core technologies to a foreign market, comprehensive research into the technology and the market is compulsory. Numerous applicable theories and models in technology transfer were reviewed to develop a comprehensive ITT model. Interviews with key individuals and focus group sessions were used to rank factors that affect the success of ITT in the financial services industry - specifically, a case in the direct short term insurance industry. These success factors were implemented in the developed market evaluation model where the user is required to enter evaluation values for each factor. The evaluation model then delivers a value that represents the market potential. This model can be used to evaluate one market or many potential markets. There are two factors that an organisation must always be aware of: the influence stakeholders have on the ITT process, and what ITT strategy is employed. Further research is proposed to validate the developed model beyond the specific case study.

## OPSOMMING

Internasionale tegnologieoordragprosesse (ITO) is kompleks, riskant, en faal dikwels. Wanneer organisasies in die finansiële dienste sektor die geleentheid bekom om besigheidsmodelle en kerntegnologieë oor te dra na buitelandse markte, is oorkoepelende tegnologie- en marknavorsing noodsaaklik. Verskeie verwante teorieë en modelle in tegnologieoordrag is bestudeer om 'n ITO-model te ontwikkel. Onderhoude met individue is gevoer en fokusgroepsessies is gehou om faktore wat die sukses van ITO in die finansiële dienstesektor bepaal, en meer spesifiek is 'n organisasie in die korttermyn-versekeringindustrie, se rangorde te bepaal. Dié suksesfaktore is geïmplementeer in die ontwikkelde markevaluasiemodel waardeur die gebruiker genoodsaak word om evaluasiewaardes vir elke faktor in te voer. Die evaluasiemodel voorsien dan 'n waarde wat die markpotensiaal bepaal. Die model kan gebruik word om 'n enkele of verskeie markte te evalueer. Die studie wys daarop dat twee faktore veral belangrik is, naamlik die invloed wat verteenwoordigers mag hê op die ITO-proses, en die ITO-strategie wat deurgevoer word. Navorsing word voorgestel om die ontwikkelde model verder te valideer.

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## 1. INTRODUCTION

There is currently a tendency for larger financial firms to globalise their business in other potential foreign markets [1]. Offshoring in the financial services industry will not be easy. Organisations that will benefit the most from offshoring are those that are leaders in their respective sectors. New and unique product innovation is a core component in an organisation's success. This article focuses on technology transfer in the financial services industry to these potential markets.

The success of a direct short term insurance (DSTI) company is based in its own distinct direct insurance brands and innovative products. The utilisation of call centre technologies and the Internet lowers operational costs. This allows the organisation to focus on marketing and branding its products and/or company. Developing strong brand names and utilising technologies can differentiate a company from its competitor [2]. The DSTI industry is dependent on 'internal' and 'external' technologies. Internal technologies are those technologies developed by the company, such as intellectual property, whereas external technologies are those technologies that are openly available in the market. These technologies are combined and utilised to develop a unique and profitable product. Internal technologies contribute the most towards a company's competitive advantage, whereas external technologies can be duplicated in the industry. However, duplicating a company's competitive advantage is not so easy. Tacit knowledge holds the key to competitive advantage [3]. The DSTI industry is aggressive, and motivates innovation by using technology to gain speed in obtaining competitive advantage [2]. The DSTI industry invests in IT, telecommunications, and call centre technologies.

The objective of this study was to develop a methodology to assist organisations in the South African financial services DSTI industry to export core technologies to the global marketplace. This methodology consists of technology evaluation methods, technology transfer methods, market evaluation, and the overall international strategy. The international strategy of an organisation influences the overall technology transfer process.

## 2. CONCEPTUAL MODEL

The organisation is an open system that is influenced by its external environment. A host of external factors influence a firm's choice of direction and action. These factors can be divided into three interrelated subcategory factors: the remote environment, the industry environment, and the operating environment [4]. The utilisation of information technology (IT), the Internet, and other communication technologies has created more open environments for companies to operate globally.

When considering offshoring, the following tools can be used to develop a suitable international technology transfer strategy: the Generic Value Chain Model [5]; the Technology Balance Sheet [6]; the Technology Space Map (S-L-H map) [7]; and the market and cultural environment analysis approach to technology transfer [8].

Multinational corporations (MNCs) become more dependent on technology to build their competitiveness in the global market [8]. Therefore, understanding the factors that influence the transfer of technology becomes more and more important. An environment-strategy-performance framework that focuses on the micro-level in the external environment has been introduced [9]. From the framework, the general strategy can be formulated, the performance of which is influenced by the organisation's strategic profile and external environment. These characteristics form part of the strategic paradigm [10].

The conceptual technology transfer process model is focused on the financial services industry, and specifically the DSTI industry, which presents industry-specific indicators to be used to formulate and develop the model. The model is based on a process model or data process diagram [11], which consists of inputs, evaluations, decisions, and outputs. The nature of the proposed international technology transfer process is derived from this

concept. The process model presented in Figure 1 consists of two segments: the technology segment, and the market segment. Each segment is rated against its corresponding environmental factors, which determine the outcome of each market or country.

## 2.1 Technology transfer process model

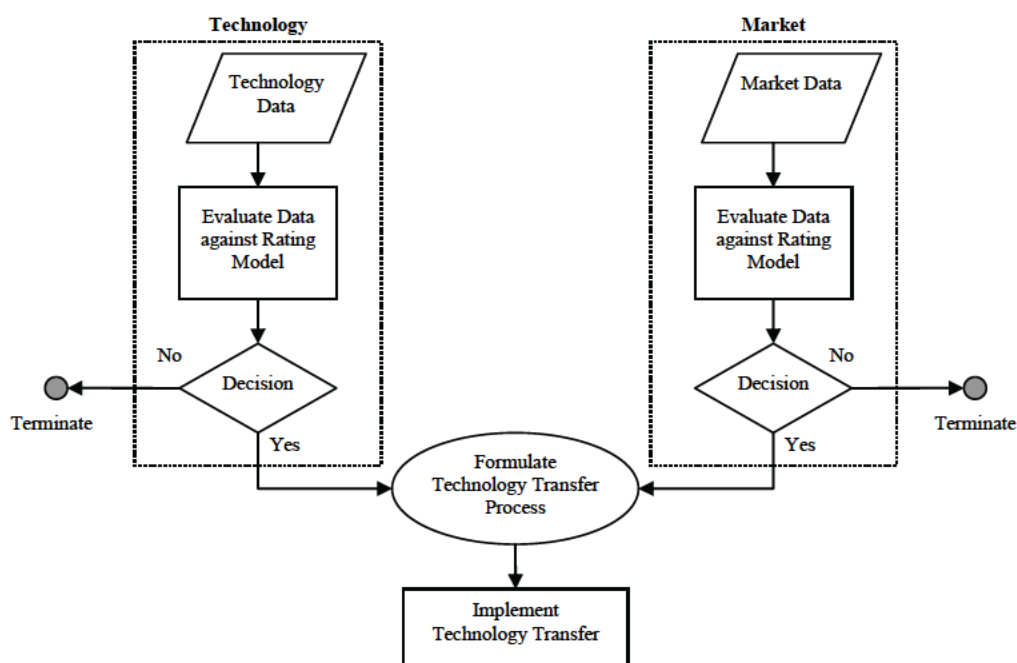


Figure 1: Conceptual technology transfer process model

## 2.2 Rating model

To conduct a comprehensive analysis on each segment (see Figure 1), it is necessary to separate these segments and develop two distinct rating models for the corresponding segments: a technology-rating model (see Table 1); and a market-rating model (see Table 2). Each rating model consists of two sub-sections. The first section is the 'elimination' section, which contains all the factors that would determine if business can be conducted in that market or country. The second section is the 'measurable' section, which contains all the factors that can be objectively measured to determine the potential of the market and technology transfer. The pre-defined industry-specific factors in each rating model were determined through the Delphi technique [12].

During the technology and market evaluation process, the user is required to enter the corresponding information into the rating model. The elimination outcome acts as a gate or milestone that first must be achieved before any other investigation can take place. To each factor the user is requested to enter yes ('Y') or no ('N'). If the user answers 'N' to any of these factors, the confidence factor will advise that the investigation in the given market should be terminated. If all these factors contain 'Y', the confidence factor will advise the user to continue with the next section, the measurable factors. The measurable outcome of the model also requires input values from the user. The value represents the confidence the user has in the given sub-factor or sub-category. The values that are assigned to each sub-factor can only be between 1 and 5 (1 = very low to 5 = very high). All these inputs are processed and assigned to the measurable outcome. The measurable outcome presents a value between 0 and 10.

<b>Technological dynamism</b>
<ol style="list-style-type: none"> <li>1. Technology transfer</li> <li>2. Adaptability of core technology</li> <li>3. Accessibility of IT (information technology)</li> <li>4. Accessibility of telecommunication technologies</li> <li>5. Accessibility of call centre technologies</li> <li>6. Accessibility of banking technologies</li> <li>7. Internet usage</li> <li>8. Innovation Index</li> </ol>
<b>Technological hazards</b>
<ol style="list-style-type: none"> <li>1. Adequate technological and management resources</li> <li>2. Language</li> <li>3. International time differences</li> <li>4. International technology development</li> <li>5. Security (information, technology and IP)</li> <li>6. Disaster recovery plan</li> </ol>
<b>Legislation</b>
<ol style="list-style-type: none"> <li>1. Corporate policies</li> <li>2. Legal policies</li> <li>3. Dealing with licences</li> </ol>
<b>Financials</b>
<ol style="list-style-type: none"> <li>1. Adequate financial resources (technology transfer cost)</li> </ol>

**Table 1: Rating model - technology factors**

<b>Market dynamism</b>
<ol style="list-style-type: none"> <li>1. Size of population</li> <li>2. Size of market</li> <li>3. Non-life insurance premium written (value)</li> <li>4. Competitive advantage (ex price or product)</li> <li>5. Competition: No players</li> <li>6. Market growth</li> <li>7. Trading across borders</li> <li>8. Starting a business</li> </ol>
<b>Market hazards</b>
<ol style="list-style-type: none"> <li>1. Language</li> <li>2. Employing workers</li> <li>3. Natural disasters (risk level)</li> <li>4. Customer behaviour towards the business model</li> </ol>
<b>Legislation</b>
<ol style="list-style-type: none"> <li>1. Political stability</li> <li>2. Paying taxes</li> <li>3. Protecting investors</li> </ol>
<b>Financials</b>
<ol style="list-style-type: none"> <li>1. Start-up costs</li> <li>2. Marketing costs</li> </ol>

**Table 2: Rating model - market factors**

Through focus group discussions and interviews (see section 3) it was advisable to apply additional weighting to the value the user assigns to each sub-factor. More weighting should be applied to the high end values (ex. 1 and 5) and less weighting should be applied to the more average rated values (ex. 3). The number of sub-factors is represented by 'n': 15 for the technology rating model, and 18 for the market rating model:

$$\sum_{i=1}^n (x_i - 3)^2 \quad (1)$$

To ensure that the low confidence rated sub-factors apply enough negative weight to the model, based on the defined formula (1), the following change was required:

$$\sum_{i=1}^n -(x_i - 3)^2 \quad (2)$$

where  $x < 3$ .

Based on equations (1) and (2), the confidence result can be formulated as follows:

$$f(x, y) = \frac{\sum_{i=1}^n (x_i - 3)^2 + \sum_{j=1}^n (y_j - 3)^2}{n} \quad (3)$$

This factor presents a value between -4 and 4. By using the sum of squares it is possible to obtain the average weighted adjusted factor, which represents the market.

To convert the confidence result of equation (3) into the more logical format (between 0 and 10), the formula presented below is applied, and this presents the 'measurable outcome':

$$g(x) = 10 \left( \frac{x + 4}{8} \right) \quad (4)$$

This factor presents the confidence the model has in the given data. The measurable outcome value results are interpreted as follows:

- Between 0 and 6: terminate the selected market;
- Between 6 and 7.5: more investigation is required into the selected market; and
- Greater than 7.5: the selected market can be considered for the transfer of technology and/or business.

### 3. RESEARCH METHODOLOGY

Different research methodologies and techniques were used to analyse and assemble the data. These consisted of interviews with key individuals and focus groups, primarily in one DSTI organisation as a case study. Assembling information from an interview or focus group session proved to be very effective. The one-on-one human interaction provided information and advice of a higher quality. The environment was informal, which assisted the discussions in general.

#### 3.1 Interviews

Conducting interviews with individuals who are specialist in their fields provided specific information on the markets or sectors. These individuals could give critical advice in areas of research. It is sometimes difficult to extract the appropriate, required information from

a general interview; therefore, it is crucial to design the interview beforehand [8]. This allows the interviewer to guide it in the required direction. It is also necessary to prepare for the interview and know what additional information is required from it. Interviews with educated individuals are expensive and time-consuming, and conducting a second or even a third interview should be avoided for those reasons.

### **3.2 Focus group method**

The focus group method is suitable for 'what', 'how' and 'why' questions [13]. These discussions produce data rich in detail that must be considered throughout the research. On the other hand, the focus group consists of executives and other decision-making individuals, and arranging a suitable time can be a challenge on its own. To ensure the success of the discussion sessions, careful planning must be done in designing them to ensure a non-threatening environment [14].

The people involved in the focus group discussion sessions were IT managers, actuaries, technology managers, marketing managers, operational managers, business and general managers, and other executives who were all directly involved in the technology and innovation process of the organisation. This provided an adequate number and range of people with diverse experiences covering all aspects of technology and business transfer. The focus group discussions took between one and two hours, and provided enough relevant data for the research problem. To investigate the research problem, the following questions were asked during the discussions:

- What technologies were to be transferred?
- When is the right time to transfer the technology?
- How does the market influence the technology transfer process?
- To which markets can we transfer the technology and business?
- What factors influence the markets and strategy?
- How many resources are required, and how does this influence the original company?

During the model development and testing phases, projects in the DSTI organisation were used in the analyses of results. Pre-post (before and after) projects were analysed and evaluated against the results produced using the developed model.

## **4. RESULTS**

### **4.1 Data gathering process**

The international strategist of the DSTI organisation was interviewed five times, when advice was given regarding the research problem. This individual was selected because he is responsible for the international business transfer, and has the experience to comment on the research problem. These initial interviews can be seen as quick discussion sessions, and took an average of 10 to 15 minutes.

After an overall understanding of and perspective on the research problem had been formulated, many questions (such as 'Why...?') were raised regarding the research problem. The advice from specialised individuals adds immense value to the uncertainty. Interviews were conducted with individuals who are specialists in the following areas: information technology (2 sessions); business development (1 session); marketing (1 session); actuarial (3 sessions); and international strategies (4 sessions). The questions that were put to each individual correlated directly with their respective environments. On average, these interviews took between 30 and 60 minutes. During the focus group discussion sessions, questions were put to the group, and each member had the opportunity to comment. One of the biggest benefits of focus groups is that members comment on industries in which they are not specialists, thus raising other questions that members debate further. These focus group sessions consisted of 5 to 7 members (including the researcher), and took on average between an hour and an hour-and-a-half.

From the initial interview process and focus group sessions, questions were put to individuals and members and their responses (advice) documented. The interviewers' and members' responses were then processed, and a value between 1 and 10 was allocated to each factor that influenced the research problem. These values were based on the priority the interviewer and focus group associated with the research factor (see Table 3). The values ranged from very low priority (1) to very high priority (10).

Factors investigated	Interview sessions					Focus group	
	IV 1	IV 2	IV 3	IV 2	IV 5	FG 1	FG 2
The adaptability of the core org. technology	8	8				6	6
Exporting the core technology	8	8	8	7		8	9
IT infrastructure structures	9	8	9	7		7	7
Telecommunication infrastructure structures	9	8	9	7		7	7
Call centre infrastructure structures	8	7	8	7		6	6
Banking infrastructure structures	7	7	7	7			
Language	9	9	7	7		9	8
International technology development strategy	8	8	7	9	7	7	7
Security of data	9	7	7	9			
Legislation			9	9		8	9
Intellectual property rights	7	6	9	9			
The transfer of business model		7	10	10	9	10	10
Market potential			9	9		9	9
Market size			9	9		9	9
Ease of doing business			7	8		7	7
Taxes			7	8			
Employment			8	8	7	6	6
Investor protection			9	9			
Start-up cost			5	5	5	5	5
Marketing cost			5	5	9		

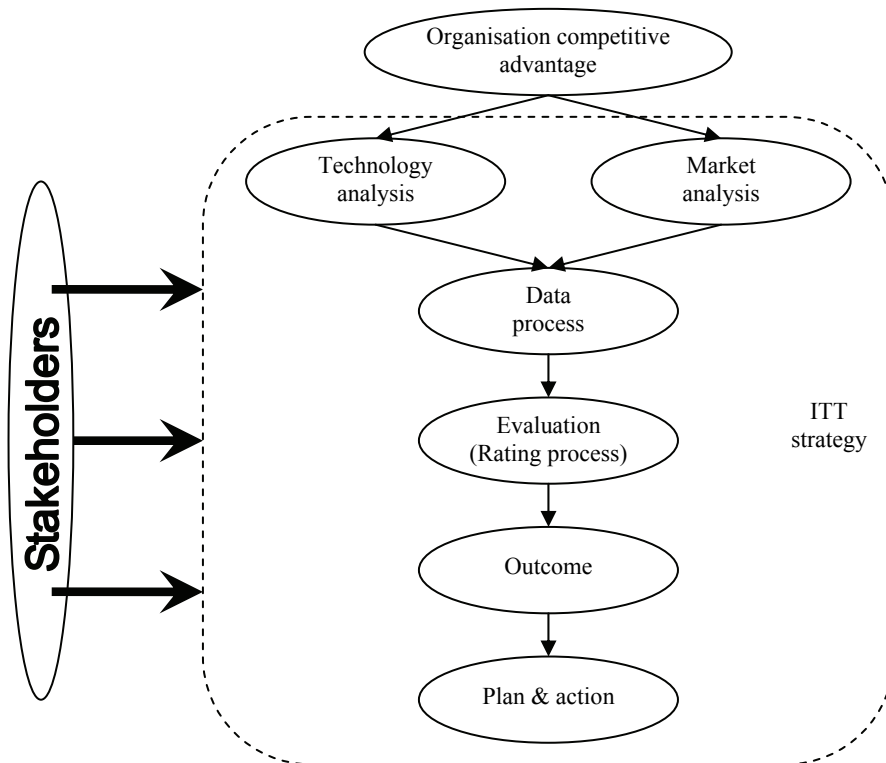
**Table 3: Prioritised factors from interviews and focus group sessions**

During the initial development of the rating models and technology transfer process, the utilisation of experimental studies guided the research. This technique helps to identify key factors (positive and/or negative) that influence the rating models and technology transfer pathways. Because case studies cannot be generalised [10], finding the most appropriate one was not easy. Case studies and experimental studies were found to be the best scenario analysis techniques through which the market analysis was done. Experimental studies allow one to predict future market performances, whereas case studies present what happened in the past.

## 4.2 Proposed theory and methods

Supplementary to the international technology transfer (ITT), one of the research objectives was the commercialisation of the technology. In the financial services industry the commercialisation of a technology determines the success of the financial services start-up in the newly selected market. Figure 2 presents a proposed international technology transfer process in the financial services industry. It is important to note how

much influence the organisations stakeholders - specifically, the shareholders and top management - have throughout the ITT process. The ITT strategy must be clearly defined from the start, as it will guide the ITT process into obtaining the optimal result.



**Figure 2: International Technology Transfer process for the financial services industry**

#### 4.2.1 Organisational competitive advantage

When an organisation gets the opportunity to conduct business in a new market, the first step is to determine what gives them a competitive advantage over their competitors in their current market. It has been found that the business model and organisational strategy enhance the success of the business. After these elements are identified, it is essential to know whether these elements can be transferred into a new market. These elements will guide the rest of the ITT process.

#### 4.2.2 Technology analysis

It has been suggested that the best time to transfer technology is when it is in its growing stage and heading towards its mature stage [15]. The most influential element in the ITT process and ITT strategy is the intellectual property rights (IPR) of the technology that need to be transferred to another market or country [16, 17]. These IPRs vary from country to country. Developing countries do not have many registered patents, and do not have the capital to research and develop their own technologies; their IPRs are therefore less strongly enforced, allowing new technologies to be transferred to them. In 1967 the United Nations created a division called the World Intellectual Property Organisation (WIPO) to monitor these acts. Developed countries have a different view of the role of IPR, which they see as a way to encourage innovation [18]. They also argue that patents are essential to international economic development, because they provide a means of return on investment.



### 4.2.3 Market analysis

The core elements that were identified, and that determine the competitive advantage in the current market, guide the market analysis. It is important that the organisation first knows its current market before it tests its own findings in another market. A detailed investigation into factors such as legislation and the market as a whole is essential.

### 4.2.4 Data process

After all the relevant data on both the technology and market had been analysed, the data were processed. The values assigned to each rating factor are based on the users' confidence, as stated previously.

### 4.2.5 Evaluation

After the data has been processed and the values are entered into the rating model, the rating model calculates a score relative to the information provided (see section 2). Table 4 presents only those countries whose final scores are greater than 7.5, and which qualify to perform the ITT process.

### 4.2.6 Decision (outcome)

The aim of the evaluation process is to present the elite group of markets, which are rated based on the rating factors. The evaluation process helps the market selection process, and presents a value that indicates the confidence the model has in the market.

Country	Technology	Market	Final result	Rank
United Kingdom	3.56	2.24	8.62	1
Ireland	3.39	1.65	8.15	2
Australia	3.11	1.76	8.05	3
Sweden	2.83	1.47	7.69	4
France	2.67	1.59	7.66	5

**Table 4: Ranking results based on the rating model**

### 4.2.7 Plan and action

Once the market has been identified, the final preparations for the ITT can begin. The international technology and business transfer project team can be selected and their full attention can be assigned to the project. The following processes are essential for the ITT: Design and plan the new market penetration strategy; design and plan the technology and business strategy; develop the technology and business model; implement the technology and business model; evaluate and test the transferred technologies; and launch the product.

The organisation's stakeholders play a large role in the overall ITT (see Figure 2). They are the decision-makers, and they will decide whether the ITT can, will, or needs to take place. The rating model highlights only the most significant factors with the biggest influence on the market. The rating model views the ITT in general and does not cater for a specific ITT strategy. The ITT strategy influences the values assigned to each factor. The values allocated to each factor must be consistent for all markets.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The technology transfer needs assessments and implementing activities presented by the Climate Technology Initiative [19] contributed a great deal to the research. Both models

considered the following: the internal and external environments of the organisation; the emphasis on the design and implementation of the technologies; technology transfer across countries; and the influence of stakeholders. One shortcoming that these models have in common is the inability to differentiate between developing and developed countries, and the influence that the ITT strategy has on the ITT process. During the research design and data analyses, the importance of the ITT strategy became clear. The government and legal systems of a market influence the ITT strategy, and so the rating model takes these elements into consideration (see Tables 1 and 2). In addition to the introduction of a market potential rating model, the proposed ITT model puts more emphasis on technology- and market analysis in terms of a specific market or country. This rating method can be executed on any given market sample, ranging from one market to many different markets or countries.

Throughout the research and data-gathering process, the research was guided through various uncertainties raised by the stakeholders. These uncertainties and questions were investigated, and the findings are described in the paper and in detail elsewhere [20].

## 6. RECOMMENDATIONS

The newly presented ITT model, although developed for a specific case, is recommended to any organisation in the financial services industry that has the opportunity to transfer their technologies and business to a new market (country). For an organisation to be successful internationally, competitive advantage is essential. It is strongly advised to obtain a competitive advantage in the current market before entering the global market. High investment costs are incurred when entering the global market. If the organisation cannot prove its success in the current market, its investors will not be convinced to invest in them further.

The financial services industry globally is relatively old and stable. If a direct short term insurer wants to grow its market share internationally, high initial investments are required. This influences the ITT strategy, as the predicted break-even point for the new venture will be between five and seven years. This period can even take longer, and is dependent on claims ratios and market growth in the new market. Another element that must be highlighted is the time and money it takes to conduct the ITT investigation. It requires that one dedicated investigator be appointed to do the investigation. One or more senior members need to advise and guide the investigation, especially when proposals and business plans are compiled for presenting to the investors. This market investigation can take eight to twelve months to complete, of which one to two months will be spent in those final selected markets. After the final decision is made by all the shareholders, an additional six to twelve months are needed to finalise the technology and business transfer plans (including the preparation, development, and implementation of the technology). Given the form of government, population behaviour in respect of the DSTI industry, market potential, and the investment cost required, Australia is identified as the market that will best suit the researched organisation. The people and culture are very similar to South Africa's, making it easier for the new company and products to be adopted. The dominant language in Australia is English -spoken by 79.1% of the population, according to the US Central Intelligence Agency - which simplifies the language element in ITT. This will have no effect on the current technology and process implemented at the research organisation.

Regardless of these outcomes, additional research through multiple cases is required to verify and validate the developed model.

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