**Successful approach for delivering new technology**

**through technology transfer program for SMEs**

**in developing economies**

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**Abstract**. In term of technology transfer Program in developing economies, the reason of transferee to uptake or receive a new technology through technology transfer is important to discover. Without knowing the ultimate reason for transferee to engage in technology transfer program, will lead into the failure of the program itself targeting technology capability improvement of the transferee.

This research discovers the ultimate desire of the transferee to accept a new technology. Through Triple Helix as the agents of technology, the technology transfer program could be conducted successfully when the reason of the transferee to receive technology is revealed. The theoretical model was empirically tested using a confirmatory approach. Using data from hundreds of SMEs, a statistically-sound version was developed This research shows that profit is the fundamental reason why the transferee agrees to participate in technology transfer program. In the absence of profits, transferor experienced the difficulty to convince the transferee to obtain the new technology through technology transfer program.

**1. Introduction**

There is some evidence to support the assertion that SMEs are important in developing countries. Developing countries value SMEs for several reasons, including: potential to grow, capability to adopt and adapt new technology, and capacity to adjust to changing economic circumstances [1,2]. Indonesia considers SMEs important, as they have the capability to create employment, and are a valuable source of economic growth and foreign currency [3].

However, in today’s rapid response global market, SMEs must improve their technology if they are to enhance their performance and survive in the global marketplace [4,5]. By improving technology, SMEs could maintain the opportunities for continuous improvement and innovation needed in the development of sustainable competitive advantage and profitability. While SMEs in developing economies experienced difficulties to improve their knowledge and technology ability, developed countries have been successful in managing knowledge and technology as the most vital resource of today’s business organisation [2,3,5,6,7,8]. Being successful in the competition, SMEs requires a rapid response capability to provide goods or services for customer needs [4]. However, the low capability of SMEs to provide the needed resources is a barrier to the in-house development of technology capability [2,9]. Due to the lack of available resources to pursue technical innovations and external resources, SMEs need technology transfer.

The process of technology transfer can be limited by the fact that technology transfer involves a technology supplier, and technology receiver who will have distinct characteristics and motives [10].Consequently, external resources to support their performance in developing technological capabilities, so-called ‘knowledge and technology transfer’ [11,12] programs, are needed. The aim of this study is to discover fundamental reason why the transferee agrees to participate in technology transfer program.

**2. Literature Review**

In this new millennium, the business world faces a new paradigm where resource-based competitiveness is being replaced by knowledge-based competitiveness [13]. Traditional measures such as land, human labor, and natural resources are no longer the most important factors, and are being displaced by human resource development, management, knowledge, and technology capability, including safety management [14,15], advanced technology [16,17,18,19] and even green technology [20,21,23].

Porter [24] asserts that technology change is one of the principal drivers of competition. It plays a major role in industrial structural change (logistics, operations, markets), as well as in creating new industries. The organisation’s ability to derive long-term benefits is determined by the capability of an organisation for choosing or creating the appropriate technology. It is important because organisations must sustain their competitiveness [24]. Better manufacturing processes as a result of a new technology will also improve effectively, and accuracy of production. This in turn will reduce ‘waste’ in manufacturing processes. Supporting technology to raise the economic scale, will improve organisations capability to maintain price competitiveness for their associated products. Another role of technology is to maintain low cost operations that will produce low cost outputs and this will directly affect the organisation’s competitiveness [25].

Knowledge and technology transfer involves technology receivers and suppliers [2,5,6,26,27]. The process of knowledge and technology transfer can be analysed based on characteristics of the transferors and also the motives of the transferees. It is widely recognised that the transferors involved in knowledge and technology transfer are government, businesses, and universities [2,5,6,7,26,27,28, 29]. Every technology suppliers and also receivers have distinct characteristics and motives [10]. We believe that the diversity of characteristics and motives will potentially affect the result of knowledge and technology transfer program. New technology that improves the long-term capability of a company is likely to encourage on-going knowledge and technology transfer. By knowing the reason of those firms to support future uptake of knowledge and technology transfer, it is possible to construct the appropriate programs for transferees, since there may be several sources of motivation. It is important, therefore, to understand the motives of transferees in up-taking the knowledge and technology program from the technology transfer agents.

The reason for the transferees could be vary. But the ultimate reason is profit [10]. For the transferees, profit is the ultimate reason for the transferees to receive a new knowledge and technology through technology transfer programs. Therefore, a company will engage in technology transfer if it can realize more profit by doing so [10]. In other word, the successful technology transfer depends on the technology capability to increase transferees’ profit. Profitability improvement caused by new technology will lead technology receiver into further commitment to improve their knowledge and technology by asking to the technology agents to transfer more technology. In many cases, in the absence of profits, non–government organisation cannot continue to exist – even the largest of organisation [24]. Once an organisation has applied a new technology that successfully supports its goal in achieving more profit, it will likely ask the transferor to transfer more technology to keep increasing the gains.

**3. Metodology**

The purpose of the fieldwork was to gather information on relevant people and organisations (using one-on-one interviews with associated questionnaires) to provide the data for subsequent analysis. The fieldwork phase of the research surveys was undertaken in the developing economic environments of Java, Indonesia. Subsequent phases of the research used data obtained from the couple of provinces in Java. These provinces were chosen because they are well established compared with others (for example, improved infrastructure, industries) and also the availability of technology transfer programs. Hundreds of SMEs associated with the manufacture were surveyed. These two provinces have a strong history in manufacturing. The SMEs have characteristics such as: clustering in the geographic location, having flexible industrial structure and also less government and/or foreign ownership. Those characteristics are common in other industry sectors in Indonesia as well as in other developing countries [29].

Profitability is important for privately owned organisations. With reference to the current research, profitability generates the funds that enable the organisation to improve its technology through technology uptake programs [10,24]. Based on preliminary investigations, and again with reference to Javanese SMEs, the following research question is posed: To what extent does SME profitability impact on technology uptake programs? Structural Equation Modelling (SEM), a statistical methodology used within a hypothesis-testing approach to multivariate analysis and will be used to analyse the survey data in this research. SEM will be adopted to quantify the strength of proposed relationships of variables.

**4. Data analysis and Result**

In this part, the participating organisation responses are analysed based on categories of five-point Likert measuring scale. Since the ordinal data used the five-point Likert measuring scale, the median is used as the primary measure of central tendencies and percentiles (25, 50 and 75) are calculated

*Profitability in organisation*

Profitability of the participating organisations was explored in this research. The profitability of an organisation is associated with its ability to achieve needed performance in measures such as net profit margin, financial return on assets and financial return on equity. Organisational profitability was measured using four statements (Table 1). The respondents were asked to indicate their perception of current organisation profitability with respect to recent performance.

**Table 1** Organisation profitability

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Median | Percentiles | Mean | Std. Dev |
| 25 | 50 | 75 |
| The net profit margin compared with last year  | 3 | 2 | 3 | 4 | 2.95 | 0.97 |
| Profit achievement compared with last year | 3 | 2 | 3 | 4 | 2.94 | 0.90 |
| Return on assets compared with last year  | 3 | 3 | 3 | 4 | 3.03 | 0.82 |
| Return on equity compared with last year  | 3 | 3 | 3 | 4 | 3.09 | 0.90 |

Scale: 1 = Much below; 2 = Below; 3 = Average; 4 = Above; 5 = Much above

The results contained in Table 1 show that the respondents expressed a median of ‘average’ associated with these current profitability statements. Items 1 and 2 percentiles indicate an even spread around this ‘average’ response, whereas items 3 and 4 indicate that respondents erred between ‘average’ and ‘above average’ for profitability issues associated with financial returns.

*Technology uptake program*

Sustainable technology transfer refers to an organisation’s management policies associated with continuing technology development programs. The commitment of participating organisations to sustainable technology transfer was explored using the five statements in Table 2.

The results contained in Table 2 show that the respondents expressed ‘agreement’ to all items with percentiles showing that respondents expressed between ‘neutral’ and ‘agree’. Item 4 showed that all organisation respondents agreed that there was a strong willingness to continue the process of technology uptake (very low percentile variability).

**Table 2** Technology uptake program

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Median | Percentiles | Mean | Std. Dev |
| 25 | 50 | 75 |
| There is sufficient organizational support for the technology transfer program | 4 | 3 | 4 | 4 | 3.60 | 0.83 |
| Top management accommodates the process of technology development  | 4 | 3 | 4 | 4 | 3.61 | 0.83 |
| Technological development is a part of management policy | 4 | 3 | 4 | 4 | 3.74 | 0.87 |
| There is a strong willingness on continuing technology uptake  | 4 | 4 | 4 | 4 | 3.90 | 0.78 |
| There is an obvious policy on evaluating technology development programs | 4 | 3 | 4 | 4 | 3.47 | 0.95 |

Scale: 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree

*Significance of correlation between variables*

The strength of the correlation between variables is presented by the t value. The target of the t value is ≥|1.96| [30]; that is, a t value ≥|1.96| shows a significant impact.

The result of the t-values test of relationships between independent variable of profitability on the technology uptake program is 6.84. The result shows that profitability has a significant impact on the uptake of technology programs. This finding is empirically consistent with previous research, which claims the potential for realising more profit is the ultimate reason transferees desire to receive new technology through technology transfer program [10]. This finding also supports the argument that when SMEs have applied a new technology that successfully supports their goal in achieving more profit, they will likely ask the transferor to transfer more technology to keep increasing the gains.

**5. Conclusion**

It is a contention of this study that the reason transferors and transferee organisations possible to fail is because there are fundamental flaws with the implementation of the technology transfer program owing to the lack of understanding of the critical factors. In this research is that the fundamental factor is a motive. And the motive is profit. The profitable technology received through the technology transfer program must be continuously developed to create better organisational technology capability. This research shows that profit is the fundamental reason why the transferee agrees to participate in technology transfer program. This consistent with previous research which claims the potential for realising more profit is the ultimate reason transferees desire to receive new technology through technology transfer program [10]. This is also valuable for the transferor organisation to use as technology transfer effectiveness criteria with regard to transferor technology transfer programs by knowing the motive of the transferee. Whilst not specifically tested for, it should be clear that organisations must establish a strategy driven by a policy that is committed to continual technology transfer based on mutual understanding.

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