PRIVATISATION AS A STRATEGY FOR IMPROVEMENT OF TECHNOLOGY CHOICE AND ACQUISITION PROCESS: EVIDENCE FROM TANZANIA*

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From 1960s to 80s technology choice and acquisition in Tanzania was largely determined by multi lateral or bilateral agreements. After privatisation all decisions to choose and acquire technology were transferred to the “new” owners and managers.

Although some studies have shown that industrial companies in Tanzania have performed better after privatisation, such studies have not shown how technology is chosen and acquired after privatisation and how such process may have contributed to the management and of companies’ inputs, processes and outputs.

This paper is part of a comparative study conducted at Tanzania Portland Cement Company Ltd, Tanzania and China Friendship Textiles Ltd, Coca Cola Kwanza Ltd, and Tanzania Breweries Ltd by using questionnaire which covered 111 employees, in-depth interview of key informants and observation of industrial processes¹.

It is concluded that privatisation of formerly government owned processing industries has not only improved technology choice, acquisition and industrial competitiveness, but also has helped to strengthen the position of Tanzania industrial sector in international economic system.

INTRODUCTION

Industrial profile and performance in Tanzania

The position of Tanzanian’s industrial sector is best explained by using a historical approach, because strategies that were adopted to establish and develop this sector have taken an evolutionary process. From the earliest years of independence, Tanzania adopted import substitution industrialisation (ISI) as her strategy for rapid socio-economic development. The focus was on production of basic goods for local demand rather than for export, although there was a considerable export of locally manufactured goods, particularly textile materials. The ISI approach was used by most of the newly independent

* I acknowledge technical and financial support to conduct the study from African Technology Policy Studies Network

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states of the third world. This choice of strategy was influenced by the then modernization theory, which was backed heavily by western experiences on industrialisation success stories in Latin America which followed anti dependency theories of economic growth.

Therefore, from the 1960s to 1980s Tanzania’s economy was dominated by government owned manufacturing industries that were established through financial and technical support from the World Bank and from multilateral and bilateral donors. The National Development Corporation (NDC), which was also a parastatal organisation, was established to spearhead industrial investments in the country (Wangwe, 2001). These industries enjoyed both monopoly of the internal market and government subsidy, which stifled the private sector.

As in many other places in Africa, the ISI strategy did not work in Tanzania as expected due to various internal and external problems that were experienced from mid 1970s through 1980s and also over state protection. These include lack of qualified staff, and mismanagement, the oil crisis, the death of the East African Community (EAC), and the war with Uganda, which pushed the government into unprecedented expenditures and debts. Much as these problems are important in explaining the circumstances which led to the collapse of the industrial sector in Tanzania, technological dependency on the western technology transfer systems is also an area of concern. Indeed, in the early 1980s we reached a stage where we could hardly make our own independent decisions on technology choice and acquisition without strong influence from western expatriates and financiers. The understanding of this technological background, which is the centre of our theme, is important as we strive to put back the industrial sector performance to the road.

The reforms and manufacturing sector performance

From 1980s, the government embarked on some far-reaching reforms, which included withdrawal from direct control of the economy, promotion of investment in the private sector, fiscal policies aimed at containing inflation growth, and establishment of friendlier tariff systems.

The reforms have already achieved such positive macro economic indicators as follows: Tanzania’s GDP has risen to over 5% (with population growth rate at 3.5%), the inflation rate has fallen to 6%, the exchange rate has remained reasonably low, and the foreign exchange reserves position has tripled (World Bank, 2001).

By such and other achievements, Tanzania is considered to have maintained the most robust economic growth in Sub Saharan Africa. With highest potentials for competitiveness being forecasted, Tanzania is also likely to be among the first 20 fastest growing countries in the developing world (WERCID, 2000). The industrial sector is reported to be growing at the rate of 4.5% raising employment from 129,250 in 1996 to 153,934 in 2000 (BoT, 2000). The major explanation is the improvement of macro economic policies including the encouragement of foreign private sector investment in the manufacturing and other
sector, and also the establishment of a more favourable investment climate. The Sustainable Industrial Development Policy (SIDP) document which covers the period from 1996 to 2020, and focuses on empowering the private sector in order to become a strong engine of industrial development, seems to provide some more possible explanations for the emerging success stories. However, CTI, DI and Mbelle, (2000) were sceptical of the industrial progress achieved in Tanzania, arguing that the response to privatisation was rather slow compared to expectations.

Table 1 displays a positive trend in industrial growth in Tanzania especially from 1995 to 2002. However, this trend should not be seen as satisfactory since there are many explanations for the recorded industrial growth including better fiscal and monetary policies. We need to understand how companies are able to cope technologically and remain competitive in production process.

**Technology choice and acquisition in manufacturing companies in Tanzania**

For analytical purposes, the researcher has used the word ‘technology’ in a restricted way to mean: machinery, equipment, spare parts and the knowledge embedded in the process of their use in the production process. In this paper, technology choice and acquisition process means the decision making process on outright purchase of machinery, equipment and spare parts.

A review of the patterns and trends of technology choice and acquisition in Tanzania provides two scenarios. The first one is the pre-reform period scenario (1960s through 1980s), in which technology was mainly acquired through partnership arrangements in the form of sister industries and bilateral agreements. Tanzania Fertiliser Company, Tanzania Portland Cement, and Tanzania – China Friendship Textiles are some of the cases (Shungu; 1982). In this case, the process of choosing and acquiring technology was mainly determined by the supplier of a particular technology and the interests of the foreign sister company or donor. The recipient of the technology had a limited decision making role due to lack of enough technological know how, resources and power to make decisions. The second one is the after – privatisation policy scenario (mid 1990s to date), in which all decisions to choose and acquire technology are in the hands of owners or managers of the industries including responsibility and accountability of such decisions.

**Table 1: Growth of the manufacturing sector from 1988 to 1998**

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<td>% Growth</td>
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^2World Economic Forum and Center for International Development

^3CTI is Confederation of Tanzania Industries and DI is Confederation of Danish Industries
The problem and context

The positive industrial performance shown in Table 1 is an indicator of the success of privatisation, derived mainly from better management of different components of the manufacturing companies sub systems. However, although privatised companies are performing better after privatisation (undoubtedly also as a result of improved management of technology), no research has been done to show how technology is chosen and acquired after privatisation. Therefore, the study assessed the process of technology choice and acquisition and its contribution to the management of four manufacturing companies in Tanzania. Knowledge in this area was seen to be important because it would provide some useful information on the extent to which the production sector in the country is moving away from the old paternalistic tendencies towards more market oriented technology choice and acquisition process. Therefore, the focus on technology is not arbitrary, it is based on the assumption that technology would provide an argument for inferring on the competitiveness and sustainability of the emerging private sector.

Analytical framework

The choice of the type of technology, source of supply, timing and facilitation mechanisms is influenced by various factors that may help or constrain decision makers (Muller 2000, Robins, 1990; Stewart, 1991). These include power to make such decisions, information on the different types of technologies available and sources of supply, accessibility, knowledge about the technology itself, the process and conditions of acquisition (DeLone and McLean, 1992; Adelman, 1997). Some of these factors are within the control of the “decision maker” (who might not necessarily be the manager) while others are under the control of the supplier or other actors in the system (Johnson, 1991, Daellenbach, 1994, Waring 1996). Therefore, from this pool of concepts, the paper isolates and uses an analytical framework that combines systems ideas of organisations, decision-making (Simon, 1960; Ackoff, 1962; Drucker, 1967; Zsambok and Klein, 1997; and Guisseppi 2000), and social carriers of technology (Muller 2000) in order to determine their influence on the selected industries’ production sub systems (Bertalanffy, 1968, in Checkland 1981). Figure 1 displays the proposed conceptual relationships of these variables which is used as basis for guiding the focus of the paper.
Figure 1: Analytical framework

Company Technology policy → Access to Technology → Organisation Structure → Search for alternatives (Decision making process)

Needs Identification → Power

Search for alternatives

Choice of a specific alternative optimal decision to acquire machinery and or spare parts

Remain with the old technology → Change some aspects of the old technology → Adopt and adapt new technology

Use of the same old supplier(s), use old and new suppliers or use new supplier(s)

Impact on Production Sub Systems

Improves inputs, process and outputs → Weaken inputs, process and outputs? → No Change?

Source: Author
The analytical framework starts with a premise that there is a need to improve technology, which in any case will affect the types, quantity and quality of inputs in the production process. An organisation with explicit policy on technology will gain from it in the process of searching for alternatives, because it can be used to form criteria for decision-making in the process of searching for alternatives. The ability to make such a decision will also depend on the extent to which the company fares in the organisational social carriers of technology. The dotted arrows in Figure 4 display a two-way relationship between, for example, availability of technological information and knowledge or information and power etc. The idea is that each component in the social carriers of technology has an influential relationship to the other. At the end of the day a decision will be made which may lead to using the same technology, combining old and new or adopting and adapting new technology to suit the organisational environment. The outcome may lead to improving industrial competitiveness by reducing costs or increasing profits as a result of better management of inputs, process and or output. The two-sided arrows suggest for interactions between stages and processes where feedback is given. For example, if there are reported technological problems at the production level, that will be a signal to problems with technology choice or supplier. It could also filter back to the needs identification, policy or social carriers of technology levels.

**Definition of key concepts**

**Technology** is explicit and tacit knowledge embodied in machinery, equipment or spare parts.

**Policy** is purposeful course of action that is known to various decision makers on technology choice and acquisition process.

**Power** is ability to do something. Inability to change obsolete technology may be due to lack of capital or conditions attached to the acquisition of the technology from the supplier. This will also mean lack of power on the part of the manufacturing company.

**Social carriers of technology** are the strengths of the organisation as compared to the supplier of technology. In other words, it is the extent to which the organisation has interest, power, relevant organisation structure, information, accessibility, and knowledge about certain production technologies. An organisation will have weak social carriers of technology if it is on average not fairing well in the above variables.

**METHODOLOGY**

**Areas of the study**

The first one was Tanzania Portland Cement Company Ltd (TPCC), located at the Wazo Hill off Bagamoyo Road. The company was established in 1996 by the Tanzania government as part of the Import Substitution Industrialisation strategy. TPCC Ltd was privatised in 1998 to form joint ownership between Tanzania government and SCANSEM (I) Ltd, a Swedish company, latter Heidelberg Cement Group of Germany. The number of permanent employees was only 270.

The second company was Friendship Textile Company Ltd (FTC) located at Ubungo Industrial Area along Morogoro Road. The Company was established in 1968 under
support from the Chinese government. In the course of privatisation, partnership was forged between the Tanzania government and the government of China in 1997. It used Chinese technology to produce cotton fabrics – “Khanga” and “Vitenge”. It had 1350 employees.

The third was Tanzania Breweries Ltd (TBL) Dar es Salaam branch, which was located along Uhuru Street in Ilala Municipality. The company was established in 1966 by the Tanzanian government. Through privatisation, TBL came under joint ownership between Tanzania Government and South African Breweries (SAB Miller) in which the latter controlled the majority shares. There were also about 20,000 individual shareholders from the public. TBL produces alcoholic beverages including lager beer, and it is the only company in Tanzania enjoying full monopoly in the industry. The total number of employees was 450.

The fourth was Coca Cola Kwanza Ltd. This is a purely private company and therefore since it is not one of the privatised firms, it is excluded in this paper.

**Sampling and sample size**

The sample size for the three privatised processing industries was 111 respondents. The sample was selected purposively in order to capture respondents who were knowledgeable enough in technology acquisition process in relation to organisational performance and also willing to fill in the questionnaire. Heads of departments and senior managers were included because of their positions in decision-making.

There were only eighteen (18) females in the sample, which should not be seen as unusual because men occupied most of the technical jobs particularly at the supervisory and management levels. This is a reflection of gender inequality in education and employment in the country. Table 3 shows sample distribution by sex.

The level of respondent’s education varied from standard seven to University. However, we included only two respondents from the standard seven category because they had long experience in handling machinery and they were also supervisors.

The sample covered as many departments as possible but focused more on technical and production departments because more employees were knowledgeable in technology issues.

**Data collection and analysis**

Although by and large the study was qualitative and most of the decision makers were at the top level of management and hence involving low cadre staff might have not been very useful yet low cadre staff had to be involved. The first reason was that even very junior staff should have technological knowledge (tacit or explicit), which may not necessarily be shared by top management particularly when there were machinery breakdowns. However, when reporting to senior officials their reports should usually form part of key inputs for decision-making at the top level of the organisation structure. The second reason was to get the general perception of staff involved in technology issues so as to get the general direction for designing more focused interview schedule for senior staff.
Therefore, structured questionnaire with closed and open-ended questions was prepared and pre tested before use. One research assistant was trained in order to understand the objectives of the research, the objectives of the questionnaire, and the content of the questions. Permission was sought from the chief executives of the companies or those who were acting on their behalf, and copies of the questionnaire were distributed through the support of various heads of departments. There was close cooperation between the heads of departments in identifying employees who were willing and could fill in the questionnaire as well as making continuous follow-ups. Each filled in questionnaire was either returned to or collected by the heads of departments or by the researchers. Data was also collected through in-depth interview of key informants and review of some documents. Observation of manufacturing processes and workshops was also made. The analytical tools employed were percentages to compare opinions, cross tabulations to compare companies and content descriptions on verbal information and observation.

**TECHNOLOGY CHOICE AND ACQUISITION PROCESS AFTER PRIVATISATION: EVIDENCE**

**Technology choice and acquisition process**

This section presents an assessment of the different processes of technology choice and acquisition as interactive sub systems (refer to the research objectives and the analytical framework in Figure 4). The following sections and sub sections guide the process.

**The policy and process of technology choice and acquisition**

The first attempt to study technology choice and acquisition was approached from a company policy perspective. The assumption was that an organisation with a clear technology policy was likely to make better choices than one without it. The results from questionnaire suggested that most employees were aware of the existence of policies on technology choice and acquisition in their respective organisations. Data from Table 2 (Appendix 1) shows that on average, taking all the four companies together, 57.6% of the respondents were knowledgeable of technology policies in their organisations. However, in-depth interviews revealed that the employees’ understanding of the term “technology policy” was too general to warrant conclusions from the data.

In all the four organisations, there were no specific written policy documents for guiding decisions regarding technology choice and acquisition, to which a manager could use to make reference. What existed, as policy was more of norms, practices, and procedures, which were commonly known by managers, particularly in the engineering and procurement sections. In other words, according to one official, it was more of “how we are expected to do things here”. This official also made reference to some statements in some documents that provided a particular guide for procurement of machinery and spare parts. For example, Tanzania Breweries Ltd had no specific technology policy document other than procedural requirements that were known to managers depending on the seriousness of
the technology issue at hand. When technological shift was required, the procedure was that consultation and approval had to be made at various management levels. The process started from the responsible department in the Branch Company, East and Central Africa headquarters, and sometimes even those involved in Asian branches were consulted. There was well-established technical committee housed in South Africa for dealing with technological issues for all branches in Africa and Asia. For example there was a project proposal to replace an old Czechoslovakian-based technology pasteurising plant with Italian one. The policy guide on the project proposal (though again no document could be referred) was cost, efficiency, maintainability and payback period.

TPCC Ltd was somehow similar to the previous cases in that there was no particular written technology policy that was used when it came to purchase of machinery, other than following normal procurement procedures. However, technology was acquired through competitive bidding. For example, rehabilitation of Kiln No. 2 based on FLS Midth technology from Denmark was tendered. Many companies applied including NOREMCO (from Norway), Wazo Engineering (Dar es Salaam) and Enikon from Croatia. The latter won and was awarded contract.

Tanzania – China Friendship Textile Co. Ltd. was still using the old Chinese technology and no technological changes were made. However, the company had developed a business plan supported by a loan from Exim Bank of China, which focused on buying world class technology in order to produce textiles for export market which meet conditions of quality, quantity and price. The strategy was prompted by the decision of the two governments to make FTC one of the exports processing zones in the country. Although there was no established operational policy document on how technology will be chosen and from where, minutes of the Governing Board made it clear that there should be a policy for procurement of machinery that considers best options in the world. Examples of types of best technologies and suppliers were mentioned in the minutes including design and washing technology (from Holland), weaving technology (from China), and spinning technology (from Schlafihast in Germany). Therefore, it may be inferred from the findings that having “technology policy” as an operational document is not seen as important as having strategic focus on how to become technologically competitive, which is driven by product market.

It was also found that the process of technology choice and acquisition in all the four companies was systematic, starting from the responsible departments to the highest levels in the authority structure. In all the four companies, the approach was to establish the need for new technology, writing a proposal and forwarding it to all channels in the management hierarchy whereby the highest organ in the structure (Board) made final decisions. That was the case for TBL (the new pasteurising plant), TPCC (rehabilitation and use gas from SongGas Ltd) and FTC (new production line for export market). More details are covered in the following sections.
The relationship between the process of technology choice and acquisition and social carriers of technology

The process of searching for alternatives
Before establishing the relationship between the process of technology choice and acquisition and social carriers of technology, it was considered that search for alternative technologies and sources of supply were the most important components of the whole process of technology choice and acquisition as a sub system. This is because the quality of the decisions made would largely depend on the extent to which several alternatives were sought and weighed. The best alternative chosen would also depend on how strong each of the companies was in the social carriers of technology dimensions (refer Figure 3). Therefore, our first interest was to know whether the companies did search for different alternative types of machinery or spare parts from different sources of supply. A summary of the findings is shown in Table 3 (Appendix 2).

It appears from Table 3 that to a large extent there was a rational approach in the process of technology choice and acquisition, and employees knew that the process involved a search for different alternatives. Interviews with key informants confirmed the same results that search for alternatives were based on specific criteria. For example for TBL, German technology was preferred over Japanese technology because of price and maintainability. Referring to the process for search of alternative technologies, one senior engineer from TBL commented:

...we cannot advise the board to adopt certain technologies without strong project write up which justifies our decisions. It is like when we planned to replace an old pasteurizing plant from Czech technology with Italian one. We collected all the necessary information on production, marketing, finance, engineering etc in order to come up with best options. We had to consult our technical team based in South Africa, which is conversant with different technologies and suppliers worldwide. Remember that we are not based in Tanzania alone. Furthermore, there may not be technological differences as such, but much more on efficiency, price, maintenance and payback period.

The next step was to find out if there was a link between search for alternatives and social carriers of technology. In this case, the assumption was that success in search for alternatives would depend on the extent to which the decision makers (Board, chief executives, managers) were in favourable positions in relation to the components of social carriers of technology. To remind us, these components are interest to acquire certain technology, power (ability to negotiate, funding), and relevance of organisation structure to accommodate new technology, availability of information, access and knowledge of the workforce. The rationale was that if there was no strong relationship between searches for alternatives and social carriers of technology, then, the process for searching for alternative technologies and sources of supply would have been undesirable and ineffective. Tak-
ing one component of social carrier of technology at a time, the following were the general patterns.

*Interest to change the type of machinery*

The first starting point was to find out whether the manufacturing companies had interest to change the types of machinery and or parts. This was important because privatisation should create room for technological upgrading, and having interest to change inherited obsolete machinery from former parastatal organisations should have to be a starting point. Failure to do that, such investors would be just short-term opportunists rather than real business people.

TPCC Ltd, as seen earlier on, had to change technology in order to reduce costs of production and maximise profits.

Referring to change of technology and factory rehabilitation, one senior manager said:

...Kiln Humboldt Company from Germany supplied the initial technology but in 1982 the factory almost collapsed because of many reasons including tear and wears of Kiln No 1. In 1985 we applied and received loan from SIDA for rehabilitation so that the factory could be privatisation - worth... we installed Kiln No 2 (now under major rehabilitation) based on Danish technology supplied by FLS Midth Company Ltd. We also want to install Kiln No 3 with a higher capacity of 900 tones per day in order to meet market demands.

There was no specific answer as to why Kiln Humboldt was not approached to supply the plant, although there were various reasons mentioned including failure to trace old factory drawings and contact addresses. However, it was estimated that the rehabilitation of Kiln No2 and Raw Mill to use Songosongo gas more than fuel and electricity would cut costs down from Tshs.360 Million to Tshs. 22.5Million per month.

TBL Ltd had also an interest to use modern pasteurising plant because although the Czech - imported machinery was still in use, it was too old and expensive to maintain.

FTC Ltd used old technology from China, of which there were spindles capacities of 360,000 with narrow looms of 680 and 50 to 60 inches width. This technology was only useful for producing fabric for khanga, kitenge, school uniform and bed sheets. It was, therefore, important to obtain better technology for producing export textiles.

*Power to change technology*

When we look at power as ability to negotiate and financial muscles, the results were promising, although data from questionnaire showed unexpected results. In-depth interviews and reference to various documents suggest that all the four companies had power to change technology. All the four companies, being international and hence able to harness financial resources from local and international levels, provided the strength to choose and acquire modern technology. TBL, being under South African Breweries International (SAB Plc), enjoyed external resources like any other branch worldwide. SAB Plc was financially powerful. In 1999 it was listed in London Stock Exchange and able to raise over USD 500 million. FTC Ltd obtained loan from Exim Bank of China worth 16 million USD for purchase of machinery and
equipment. TPCC Ltd was one of more than 10 cement companies in Africa, leave alone others worldwide under Heidelberg Cement Group. It had outsourced management to Scandinavian Cement Company (SCANCEM Ltd).

Generally, interviewees felt that once decisions to choose and acquire technology were technically and financially justifiable, and buying machinery was not a problem because it was like any other shopping exercise. The trickiest area was how to justify that it was worth spending millions of dollars to acquire such technology.

Relevance of the organisation structure in relation to search for alternative technologies
This part was seen important because of the assumption that after privatisation, new organizations, supposedly more profit oriented, will need flexible organisation structures that can quickly respond to market demands. They will also attempt to improve technology by looking for the best options available. New technologies may also require fewer employees, which will automatically lead to reorganization of the organization structure. These strategies will indeed reflect a departure from old characteristics of parastatal organisations which were inflexible and which used labour intensive obsolete technology. Data from key informants were useful here because the latter were more informed of the restructuring processes.

Interviews and physical visits in the factories to observe organisational layout and the status of machinery and workshops provided some highlights on the relationship between technology and organisation structures. All companies had reduced their workforce into less than half of the original number before partnerships. TBL Ltd Co. Ltd displayed all characteristics of decentralised organisation structure including fewer departments, positions and number of employees. This was seen as necessary for reducing role ambiguity, increasing accountability and promoting of prompt decision-making at lowest levels possible when there was a technical problem that could be solved at a subsidiary company level. When TPPC rehabilitated Kiln No 2, the workforce was reduced from 150 to 45. The crasher unit, which was part of the organisation structure, was sub contracted to NOREMCO Co. Ltd. Most of the repair work was outsourced, thereby reducing the need to manage big and costly workshops, which were not necessarily effective. FTC did try to reorganise the structure, and the workforce was reduced from 1923 employees before partnership to 1350 by the year 2004. However, the reason to reduce the workforce had no relationship with modern technology because machinery was still the same. The main reason was financial crisis in the company and over - employment. One very senior official from the company responsible for general management had an opinion that the problem with restructuring was cost of compensation for the retrenched. With the introduction of a new production line for export market, restructuring was expected to lead to combining departments and operations, chopping off some, and recategorisation of staff. Despite the good intentions of having an organisation structure that was compatible with the technology employed, it appeared that, since FTC was not a private company in its fullest sense due to strong govern-
ment influence (Tanzania and China), old habits of having bureaucratic organisation structure and swollen workforce may die-hard.

*Availability of information for decision making and search for alternatives*

Data from the questionnaires indicated that eighty eight percent (88%) of those who were aware that technology was chosen and acquired through a process of searching for best alternatives were aware of the availability of useful information for decision-making. Analysis of this is provided in Table 4 (Appendix 3).

There was a strong positive statistical association between search for alternatives and availability of information (p<0.05), which implied that there was a very strong link between availability of information and search for alternatives in all the companies. However, in absolute figures there were some differences in proportions between companies.

Nevertheless, when the respondents were asked for the main sources of technological information the results were: business partners (53.1% for TPCC Ltd; 36.1% for FTC; and 30.3% for TBL). International trade fair, Tanzania Confederation of Industries and the Internet, which should be considered important sources of information, were rarely mentioned. Data from in-depth interview largely concurred with questionnaire data that business partners were the major sources of information but, in addition, some heads of departments had computers connected to the Internet. When one official in TPCC was visited, he was downloading information from Internet, which showed how competitors were performing worldwide. When he was asked how the computer facilitated information on technology choice, he said:

> Once you have access to Internet there is no problem in finding out who is supplying what in the world. You know! Manufacturers do not hide themselves. You just browse and you have everything you want.

Regarding the use of business partners as source of information, the major explanation collapsed into the argument that since the four companies were part of major international companies with long roots of technological business links, information was abundant. For example, Heidelberg Cement Group of Germany, which owned 49% shares of TPCC Ltd had long experience with Kiln Humboldt of Germany and also FLS Midth technology from Denmark. Therefore, choosing the latter company to supply all TPCC machinery was based on prior business relationships. We have noted earlier on that TBL had a specific technical team dealing with technological issues for all companies in Africa and Asia. It was learned that since these companies were old and had business relations with machinery manufacturers world wide, it was not difficult to get information from suppliers. It had also a website (BEERnet) and the Beer South African Training Institute for knowledge management in the beer industry. FTC also fell in the same logic because the Chinese partner was experienced in Chinese technologies as well as with other foreign investors in China including Japanese companies. It was also learned that the General Manager and Chief Engineer received training from China that even helped to
make informed technological choices. However, this observation does not omit the possibility of inclining to tacit knowledge when buying new machinery rather than following principles of rationality particularly in this case where there were strong historical links with Chinese funding and technology.

Knowledge of the workforce on modern machinery

The indicator adopted for measuring knowledge was knowledge on machinery and training requirements. It was assumed that if, to a large extent, training was required before adopting new technologies and yet a company was investing in new technologies, then such a company should be progressive and determined to become more competitive. An overwhelming majority of the respondents (78.6%) had the opinion that if new machinery and machine parts had to be acquired, then to a large extent training would be required. With an exception of FTC Ltd, which still displayed all the characteristics of a parastatal organisation including having worn-out buildings, office, machinery, poorly equipped workshop etc, the rest of the companies (with few exceptions in some areas of TPCC Ltd) looked very modern in all aspects. As indicated earlier, the fact that all companies were in the process of installing modern production lines by using best technologies, meaning that training will be required, hence more organisational learning and competitiveness. The web site and training institute mentioned above were expected to provide an environment for continuous learning and adaptation.

Access to modern technology

The objective of this part was to find out whether employees were aware of the barriers to access to modern technologies created through the patent right system, and whether that affected the acquisition of machinery.

Descriptive statistics showed that the majority of the respondents did not know whether there was a problem of access or not. Follow up of the same finding through interview revealed that it was a fair response since most of the respondents were not fully involved in searching for technologies because that task was for senior management decision makers who were fewer but more informed.

Discussions with key informants did not suggest that there was a problem of access, and there were many reasons for that. The first reason was market liberalisation. Since all the three companies were originally nationalised by the government and funded through loans attached with technology conditionalities, after privatisation investors were free to use any technology supplier. Hence, it was not seen likely that suppliers would put barriers to accessibility of normal ordinary technologies such as for a processing plant.

The second reason was globalisation and information communication technology. One senior engineer trained in Europe and

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5 The company wanted to modify the processing system in order to use Sogosongo gas rather than fuel and electricity, in order to cut down production costs. SongGas Company will supply the gas from a small island in the Indian Ocean, south eastern Tanzania. Rehabilitation work was at advanced stages.
then China had an opinion that, with globalisation, it was difficult to judge the source of manufacturer and even technology itself because information and communication technology has reduced technical knowledge barrier.

The third reason was that, the four companies were mere technology users without capabilities or even interest to use such technologies for business purposes other than for production. Therefore, there was no reason for manufacturers or suppliers to fear technology piracy.

Lastly, no single manufacturer was excellent in all types of machinery and or equipment and parts required. Even if one company could produce a plant or machinery alone, that might not be economically viable because of increasingly changing market needs, competition, push for flexible specialisation and sub contracting in order to reduce operational costs. We have already cited cases of weaving/spinning, pasteurising plant, parking plant etc.

All the four companies had machinery from different manufacturers (though at times supplied by the same company), some assembled and worked together and others working independently but under the same roof. In all cases, no evidence of technology access barriers was observed.

**The influence of technology choice and acquisition process on companies’ inputs, processes and outputs sub systems.**

An attempt was made to investigate whether the process used to choose and acquire technologies influenced either positively or negatively, inputs (machinery, power, expertise and raw materials), production processes and final outputs. The assumption was that the quality of the process of technology choice would have positive or negative impact on the inputs process and outputs sub systems. In this case, for example, choosing inappropriate technology such as buying machinery that could not be easily maintained, or which was less efficient in terms of input and output ratios will also influence the ultimate quantity and quality of output. More than average of the respondents in the three companies felt that the process used to acquire technology had no negative effect on inputs. However, data from interview suggested that there could be negative impact if first, the companies were local and inexperienced in global technology suppliers, and second, there was no competitive tendering system in the procurement process. For example, when TPCC Ltd decided to change from less fuel and electricity driven technology to gas based technology, some modification of the original processing line had to be made including instalment of different compressors. It was expected that there would be reduction of costs of processing raw materials by half. In regard to FTC, it was found that the installation of the new plant for export market would not need different raw materials but the quality of cotton from farmers had to be improved because it would determine the quality of yarn, which is a critical factor in export market. The company expected to produce and export different types of fabric for various uses such as Jeans wear.

The influence of technology choice and acquisition on the quantity of production was also considered worth investigating because quantity is a good measure of tech-
nology efficiency. More than 50% of the respondents thought that there was negative effect of the machinery acquired on the quantity produced. However, data from interview provided a different scenario. There was no reported failure to produce desired quantity because of problems with technology choice as such; instead, there were reported remarkable improvements in quantity and profits. TBL was able to increase output and profits to Tshs.7.2billion from 1998 to 2002, which was an increase of 30%. It was only TPCC Ltd that was not able to produce enough for the market, partly because of remnants of old technology (which was appropriate in the 1980s) and also high cost of inputs including fuel and electricity.

Quality of output was another area of interest that was considered. Forty five percent (45%) of the respondents felt that the process used to acquire machinery hindered the company from producing quality output in time. More clarification from senior officials varied from company to company. TBL wanted to introduce canned Castle Lager beer to the European market but lacked the technology that could meet international health, safety and environmental requirements. It was not until just recently (2004) that the company managed to get a loan worth USD 18.4 million from IFC to upgrade machinery and construct health clinic for employees. The whole process for feasibility study, applying for loan and acquiring better technology took more than two years. It was also observed that the process for technology acquisition should have taken less time if capital was readily available at company level.

Initially, TPCC Ltd used to produce ordinary cement, but when the company joined partnership with Heidelberg Cement Group under SCANCEM management it was able to acquire more modern technology. This facilitated production of Twiga Cement Extra (composite cement with pure limestone), different from Ordinary Twiga Cement, which used older technology. The two types of cement were certified by Tanzania Bureau of Standards (TBS) No. 727:2002, CemII/A-L/325 and No.727:2002, Cem.1/425R. Therefore, although relatively old technology was still in use, quality was not compromised.

FTC was not worried much about the old technology when the question of quality was asked. A very senior officer had the following comment to make:

Go anywhere in the country, when it comes to Khanga and Vitenge, nobody can doubt our quality. It was only in the 1980s when we almost collapsed and Indian Khanga flooded everywhere... but now, Indian Khangas are nowhere to be seen. The only problem is the export market... and we have started to address that.

Coping strategies as a response to technological dysfunctions

The objective of this section was to identify important strategies used to cope with technological difficulties. All the four companies used the same measures when faced with technological problems. Such measures depended on the particular problem at hand, and in each case the most appropriate solution was sought.
Firstly, although in general the companies had modern production technology, there was need for improvement in order to penetrate international markets, which required certain quality standards. The solution was to acquire better technologies. For example, in 2002 TBL wanted to penetrate the world market through production of various beverages including canned Castle Lager beer. The technical solution was to acquire machinery and expertise for canning production line from Italian technology, worth USD 3million and capable of producing 260 cans per minute at full capacity.

Similarly, FTC had to seek for loan in order to improve technology and head for the international market. The following was planned.

1. Eliminate 1291N spinning frame and its upstream accessory equipment.
2. Buy one set of FA334 drawing machine and 1 set of F344 doubling machine.
3. Buy 6 sets of FA261 combing machine in order to upgrade products.
4. Eliminate 50 inches shuttle looms by adding MYTHOS–190-air jet looms and 17 inches shuttle looms.

TPPC Ltd used to use manual assembly line control systems based on old technologies, which could not detect technical faults and services required for all plants at the same time. Electronic systems had to be introduced including changing of piston compressors to screw compressors.

The second problem was that of tear and wear of machinery. The common solutions sought included fabrications, modifications or replacement of parts by using the companies’ workshops or external service providers. For example, TBL used the services of the Institute of Productivity and Innovation (IPI) of the University of Dar es Salaam and Wazo Engineering. These service providers were used when TBL lacked enough time, equipment or expertise. Machine parts, which were often repaired or replaced, were gears, shafts, wheels and bearings. The choice of the client varied depending on the complexity and urgency of the technical service required. For example, TPCC replaced Kiln Shell, but since the quality had to be attested by using ultrasonic tests, IPI was approached for the job because it was the only competent service provider. FTC had its own moulding unit and workshop for sizing and polishing (though rather obsolete). Moulding used clay, sand, crap metal and heavy oil. Wazo Engineering and IPI were also used when such services were required. In regard to replacement of machine parts including small items such as motors, gears, shafts and other accessories, it was argued that since such items were purchased almost on a routine basis, and did not involve changing technology, it was sensible to obtain them from local suppliers. Some of them were MerryWater Ltd. and HassanAli Machinery and Spares Ltd. based in Dar es Salaam. The criteria for choosing the supplier included quality, price and the urgency of the work to be done or the machine part required. Procedures for acquisition were obtained from the procurement manuals.

Conclusions, policy implications and areas for further research

Conclusions
From the outset of the study, it was noted
that there were general indications for growth of the privatised-manufacturing sector in Tanzania. It was argued that such growth could have a positive relationship with better technological choices and acquisition strategies. By combining systems, decision-making and technology choice and acquisition process frameworks, we pursued the same argument by collecting field data. Now we have some evidence that the privatisation of TBL, FTC, and TPCC has not only improved technology choice, acquisition and industrial competitiveness but also helped to increase the integration of Tanzania industrial sector into the international economic system. The systems, decision-making and technology choice frameworks have informed the study that technology choice and acquisition is not an isolated activity. It is a decision making process which involves various stages and components, which are highly interrelated and interdependent from departments to the international levels. Further to that, there is a positive relationship between the process of technology choice and acquisition and the quantity and quality of output in all four companies.

**Technology Management Policy Implications**

By looking at the whole process of technology choice and acquisition in the four companies, the following policy implications are worth to note.

Firstly, the socialist era in which technology choice and acquisition was strongly influenced by the government is gone. Government ownership of the companies through joint venture has led to the submergence of the old habits and replacement of the same by rigorous and more efficient technology acquisition processes that are driven by market forces. Therefore, the old government tradition of making blind technology policies that dictate general national wishes have limited impact on companies aspiring to or operating at international levels. Hence, policy dictation is unlikely to work. This is partly attributed to the fast growing nature of technology and the need to quickly cope with customer demands in a competitive global market where an individual country can hardly have an influence.

Secondly, government policy on science and technology need to address the demands of robust and flexible global technology market. This is possible if the government will work closely with both less and more advanced private sector, with the objective of identifying areas, where the government can create a more focused enabling environment for the private sector to make choices that are more informed.

Thirdly, technology policy that creates better enabling environment for small business partners to improve technological capabilities is not only important but also desirable. The intention is to create room for more learning than just business relationships between for example, Wazo Engineering and big manufacturing companies, which have better opportunities to access international technology. Such learning arrangements will lead to more technological diffusion, creativity and innovation in the country.

**Areas for Further Research**

This study is just an eye opener for more investigations to come. The following areas are worth consideration.
Firstly, we have noted that the four companies were linked to international corporations and hence displayed all characteristics of international companies including access to information and capital. It will be interesting to find out what is happening to purely local companies in the process of technology choice and acquisition. This knowledge is important because it can provide indicators of technological upgrading and adaptation taking place in the country and linkages with international companies.

Secondly, technology is rapidly changing, and companies, which adopt most advanced technologies, gain competitive advantage over others. It will be of value to find out how local companies can gainfully utilise opportunities created by subsidiary companies in the country in order to improve own technological capabilities.

Thirdly, the market led technology system by itself reduces the role of state in technology decision making for a country. It is, therefore, important to find out the role of regulatory organs in technology transfer and adaptation in a free market economy.

REFERENCES


APPENDIX 1

Table 2: Percentage distribution of respondents by awareness and availability of company policy on technology choice and acquisition process (N = 140)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Tanzania Portland Cement</th>
<th>CoCa Cola Kwanza Ltd</th>
<th>Tanzania/China Friendship Textiles</th>
<th>Tanzania Breweries Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>46.9</td>
<td>64.1</td>
<td>52.8</td>
<td>57.6</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
<td>20.5</td>
<td>19.4</td>
<td>15.2</td>
</tr>
<tr>
<td>Do not Know</td>
<td>28.1</td>
<td>15.4</td>
<td>27.8</td>
<td>27.2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Survey Data

APPENDIX 2

Table 3: Awareness on the presence of search for technological alternatives (N=140)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not know</td>
<td>26</td>
<td>18.6</td>
</tr>
<tr>
<td>Did not search for alternatives</td>
<td>15</td>
<td>10.7</td>
</tr>
<tr>
<td>There was search for alternatives</td>
<td>99</td>
<td>70.7</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Survey Data

APPENDIX 3

Table 4: Interest to change the type of machinery and or replace parts (N=114)

<table>
<thead>
<tr>
<th>Response</th>
<th>TPCC Ltd Count</th>
<th>Company</th>
<th>TBL Ltd Count</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>14</td>
<td>24</td>
<td>70</td>
</tr>
<tr>
<td>%</td>
<td>72.7</td>
<td>43.8</td>
<td>70.6</td>
<td>61.5</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>18</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>%</td>
<td>27.3</td>
<td>56.3</td>
<td>29.4</td>
<td>38.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>114</td>
</tr>
<tr>
<td>%</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Survey Data
Table 5: The relationships between the availability of information on the types and accessibility of sources of machinery/parts and search for alternatives (N = 140)

<table>
<thead>
<tr>
<th>Extent of Information</th>
<th>Search for alternatives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Did not know</td>
<td>No</td>
</tr>
<tr>
<td>Not Available</td>
<td>Count</td>
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</tr>
<tr>
<td></td>
<td>%</td>
<td>69.2</td>
</tr>
<tr>
<td>Available</td>
<td>Count</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>30.8</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Survey Data

9 Ignore the Coca Cola Case in all appendices