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Nkosoo 2015: Nurturing Sustainable Oil and Gas Supply Industry in Ghana

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1 A framework for development of local supply industry

This is a three years project in Ghana regarding local content in the oil and gas sector. The project started January last year. The major question in this project is how to select and nurture development of some competitive enterprises delivering quality goods and services and foster networks of cooperation that can provide the producers with a favorable business environment. Through close cooperation with GNPC, CSIR-STEPRI, and independent researchers/consultants in Ghana, the project team has select a group of Ghanaian-owned enterprises with a good potential as suppliers to the oil and gas sector. These companies are from different sectors, covering everything from engineering, ICT and electrical services, to food supplies and accounting. The selected companies have been invited to take part in a long-term enterprise development scheme. Researchers from SINTEF/NTNU and STEPRI work together with them to improve core activities as well as support functions, such as human resource and finance management.

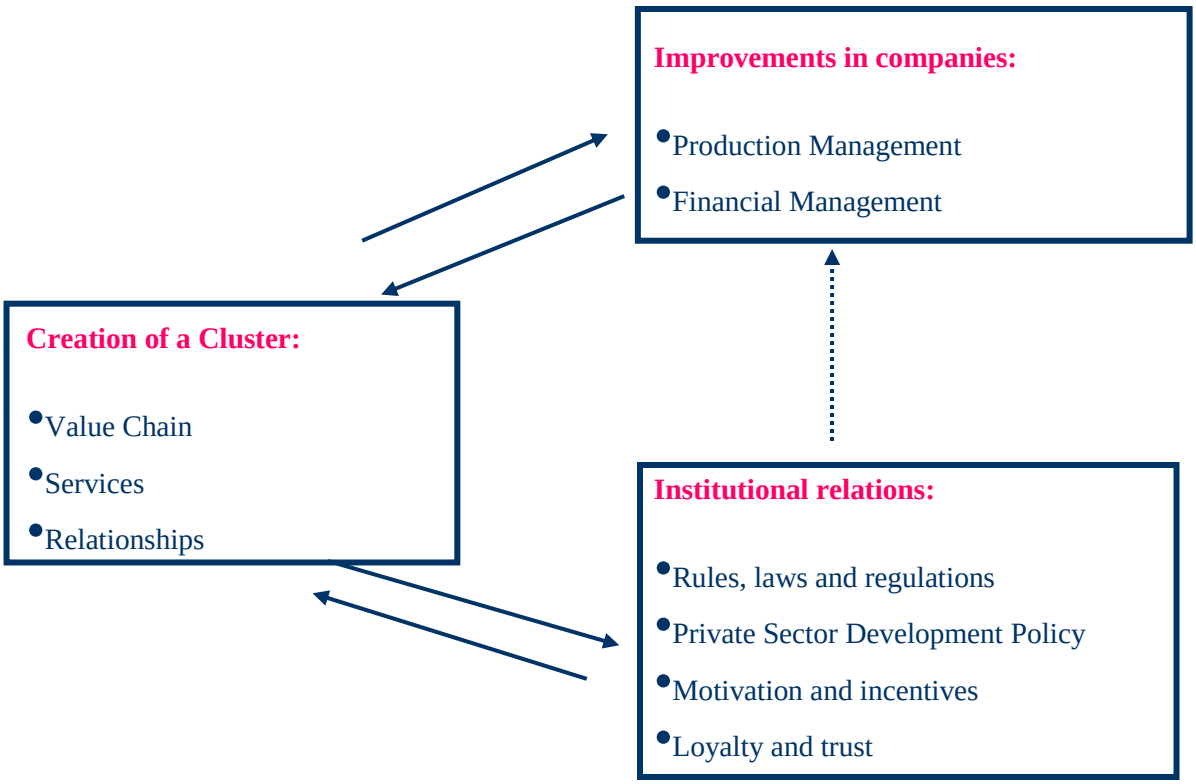
SINTEF has extensive experience with enterprise development projects in Norway and other parts of the world, including Africa. For about 10 years, 1998 to 2008, members of the project team had a fruitful cooperation with Botswana National Productivity Centre (BNPC) and Botswana industries, where the aim was capacity-building and enterprise development. The experience and contacts gained through this cooperation are be utilised in Ghana.

At the same time, we will aim to introduce some form of clustering. There is strong evidence of the impact of geographical concentration on manufacturing performance. Productivity is higher if firms cluster together. Clustering may increase the sustainability of enterprise development, in that the involved companies may pool their research and development resources and become more focused on innovation. Another potential benefit is better exploration of opportunities for business-to-business cooperation with petroleum supply industry in Norway and other foreign countries.

SINTEF is involved in a large scale research project on use of natural gas for industrial purposes in Norway where clustering is the core strategy. In Ghana, however, previous experience with geographical clusters is mixed. Many factors could be of influence here - the standard of facilities and services rendered, degree of commitment, and enterprise capacity to utilise potential advantages, to mention some. One must also bear in mind that the local economic and sociocultural context is different from that of Norway and other advanced economies, and may pose its own limitations and opportunities. On this background, the project will aim to establish a cluster for prospective oil and gas supply companies, but be ready to make local adjustments and explore hybrid forms to find a viable and optimally functioning means to facilitate intercompany cooperation and agglomeration.

Finally, the project will assess and improve institutional relations that are critical to enterprise development and intercompany cooperation. This part will be centered on the framework for private sector development like rules, regulations, incentive systems, loyalty and trust. The theoretical approach is formal and informal institutions of New Institutional Economics. Institutions are the rule of the game and consist of formal laws and regulations together with code of conduct. This project study the impact of formal and informal institutions on enterprise development, and what kind of rules, regulations, and norms of behavior that encourage private sector development.

The overall approach schematically divided into three main modules/pillars:



The knowledge built through interventions at these three levels – enterprise, cluster, and institutional relations – will in turn be used to refine and develop the project methodology. At every level, all activities will be carried out by SINTEF and STEPRI, in close cooperation with the involved companies. The total process will be a joint learning process, which also entails capacity-building in STEPRI.

2 Improvements in Companies

The basis is enterprise development and capacity –building through the Phetogo Methodology, developed through a collaborative project between SINTEF and Botswana National Productivity Centre (BNPC). The Phetogo Methodology is centered on hands-on improvement work to increase productivity and improve the quality of production in specific companies, be they manufacturers or service providers, technologically advanced or characterised by simpler processes. It has so far been applied in small and medium-sized companies.

Phetogo means "change", and the methodology is structured according to the Deming wheel, a concept of continuous quality improvement porttraying production activity as a never-ending circle of improvement. When it comes to quality management in manufacturing, the concept is well known and applied world-wide. The Pethogo Methodology expands the logic of continuous improvement, normally applied to specific production processes, to the operation of the whole company. Appropriately the project is named nkosoo meaning "progress" or "advancement" to capture the essence of the methodology.

2.1 Continuous improvements

When Deming in 1982 introduced the Deming wheel, he put on the agenda the concept of continuous quality improvement. Deming, as one of the post world war's earliest pioneers in the quality field, modelled this concept as a circle including different activities executed in sequence in a closed loop (Figure 1).

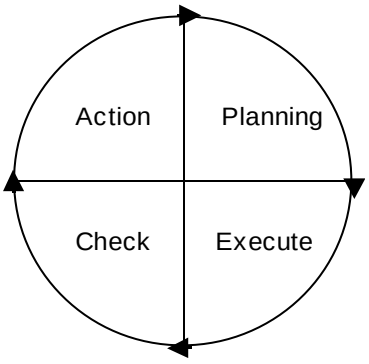


figure 1: The Deming wheel

Taking into account the principals of the Deming wheel, we have for the overall design of the Phetogo Methodology used this logic. Figure 2 highlights our implementation of the continuous improvement circle concept.

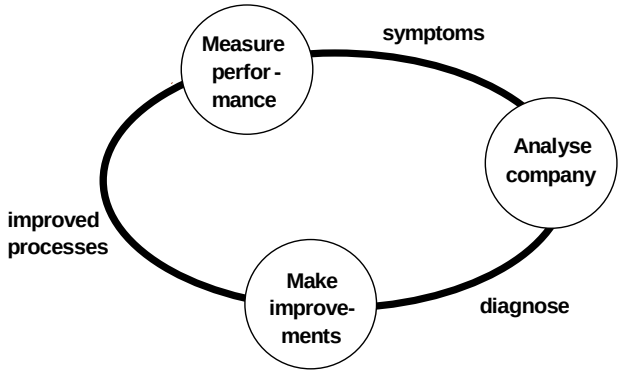


figure 2: The overall design

To start with 'Measure performance' in the company, some symptoms about the company's condition may be uncovered. These symptoms are taken further to an analysis of the company in order to find a diagnosis and a solution of the problems uncovered. Having possible solutions, making improvements, hopefully improve the company processes. The improved processes of the company then undergo a new measurement activity and this continues in a never-ending loop.

2.2 Value Creation

Value creation is in focus when we analyse companies and make improvements. Our approach is multidisciplinary by use of theories and methodologies from production management, financial management and organisational theory. Intellectual Capital is an appropriate theory when these different disciplines are put together in a common concept.

Through the last decade, economists have become aware of that a company's market value is not only reflected in physical and financial capital. Indeed other factors do contribute to the overall value of a company. Roos (1998), among others, uses the term intellectual capital as concept to identify those other factors, and divide this overall term into following four parts:

- The human capital
- The customer capital
- The innovation capital
- The process capital.

Human capital captures the value of the individuals making up the organisation. Customer capital captures the value of the customer relations of the company. Innovation capital captures the value of the company's ability to be innovative in its work process, its process- and product innovation line. Process capital captures the value of collective or organisational characteristics. The following picture gives an overview of the set of capital types the market value of a company may be divided into. The market value of a company depends on expectations. The books of account tell us about the financial situation of the company. If it is good the expectations are pretty good as well. The same could be said about human capital, customer capital, innovation capital and process capital.

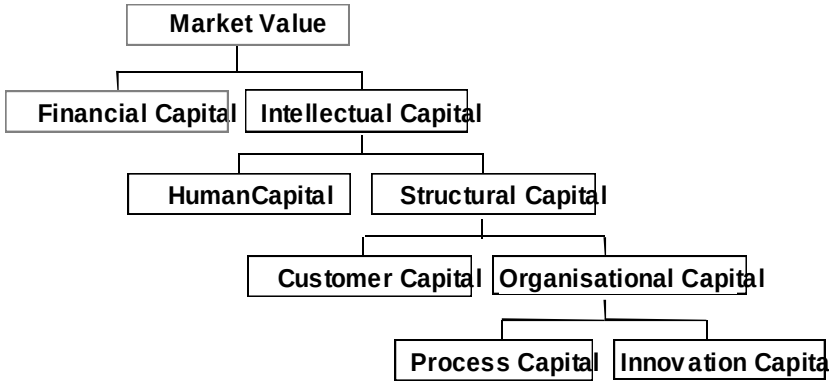


figure 3: Intellectual capital

A challenge from an analysis point of view is to find a way to measure or assess the value of the intellectual capital. It is well known how to handle assessment of financial capital, but the other capital factors are more challenging. Norton and Kaplan introduced in 1996 the method of Balanced Scorecard as an attempt to find indicators, which influence the four strategic objectives, found in figure 4. Although, they do not explicitly refer to the intellectual capital as a concept, we find close relations between the two approaches. See and compare figure 3 and 4.

Strategic Objectives	Indicators
Financial Improve returns	Revenue growth
Customer Increase customer satisfaction	Customer retention Customer acquisition
Internal Processes Increase productivity	Throughput time
Learning & growth Increase employee satisfaction	Employee retention Sick leave

figure 4: Balanced Scorecard

The basis of the Balanced Scorecard method is lead and lag indicators. A set of lag indicators (results from past efforts) are balanced with a set of lead indicators that drive future performance and directly affects the strategic objectives of a company. (Figure 4 shows lead and lag indicators to the right and strategic objectives to the left.) More about factors and indicators in Roos, Pike, Fernstrom, 2005.

Thus, we took intellectual capital and the balanced scorecard as our point of departure. Taking into account the overall business view, we needed a multidisciplinary approach to manage, measure and improve the organisational processes of a company properly. Based on that approach, we used the economical theory of intellectual capital and the balanced scorecard method to develop a variant of the balanced scorecard to be used in the Phetogo Methodology for measuring performance. The strategic perspectives of this balanced scorecard variant are found in figure 5, and reflect our multidisciplinary approach to the measuring tasks. Worth noting is that we, based on our empirical findings, found it necessary to add a fifth perspective to acknowledge the strategic importance of the industrial relations.

1 Financial
2 Customer Orientation
3 Internal Processes
4 Human Resources
5 Industrial Relations

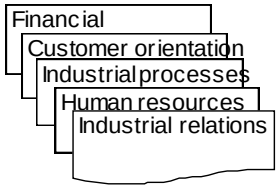


figure 5: Strategic perspectives

In addition to the relations between lead and lag indicators and the strategic objectives seen in figure 5, there is also a cause-and-effect relationship between the strategic issues themselves. This relation is given in figure 6, which shows that the human resources and industrial relations affect the internal processes, which in turn influence the customer orientation and in the end the financial situation of a company.

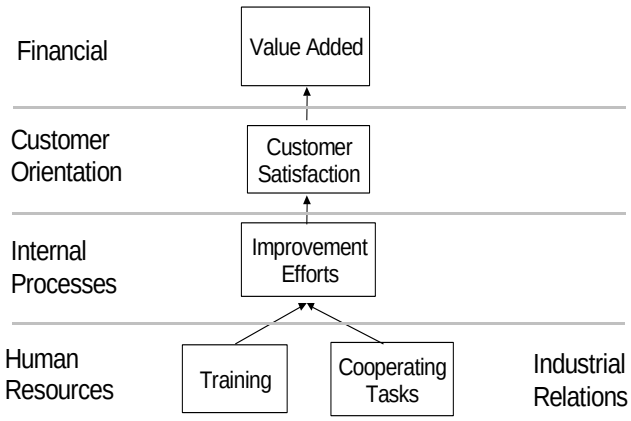


figure 6: Cause-and-effect relationships between the strategic perspectives

2.3 Perspectives & Value Chain

The Phetogo Methodology, as a framework for quality and productivity improvements, contains more than just measuring performance functionality, which affects the strategic perspective. The improvements have to be brought down from a strategic level to a process oriented level in the company. To reflect the processes of the company we have chosen Michael Porters value chain model (1985). For the intellectual capital and balanced scorecard, our multidisciplinary approach found it necessary to add new features to Porter's value chain model. Originally the value chain model contain 9 internal company processes named according to the points 2 to 10 in the following figure 7. We have as an extension, added two more processes to the model, namely the industrial relations process and the external environment process. Those two processes are numbered respectively as number 1 and 11 in the figure 7.

1 Industrial Relations
2 Firm Infrastructure
3 Human Resource Management
4 Technology & Development
5 Procurement
6 Logistics Inbound
7 Operations
8 Logistics outbound
9 Marketing & Sales
10 Service
11 External Environments

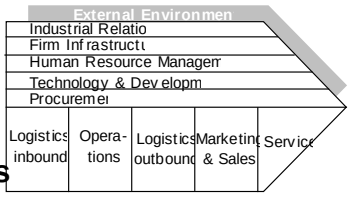


figure 7: Value chain activities

A great challenge to us was to find a relation between the strategic issues and the internal business processes of a company. In other words; when we measure performance and identify indicators that do not fulfil our strategic objectives, which tasks in the company and what kind of improvement tools are proper to change that trend? This challenge is shown in figure 8.

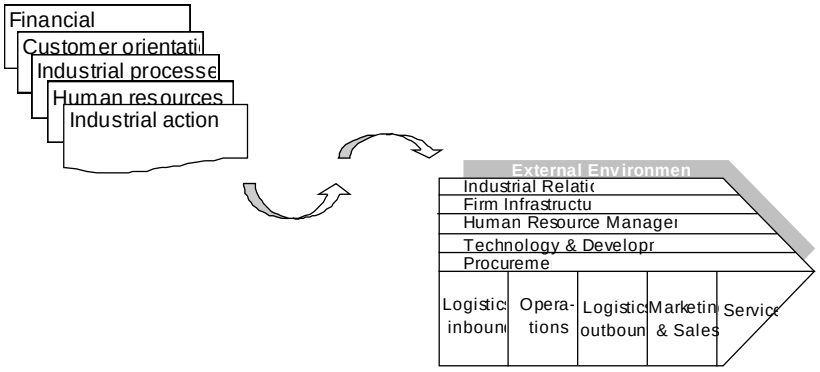


figure 8: From strategy to actions

In order to find a solution to that challenge, we developed a set of analysis tools that lead the measuring of performance indicators down to the company's internal processes.

Research methods for collection of information in the enterprises are observations and interviews, including studies of all kinds of second order data (literature, reports, accounts, job descriptions, plan documents, etc). The observations were done while walking through the production systems. Employees of all kinds, from shop floor workers to the top management, were interviewed. Information from these investigations was analysed by applying relevant theories from the different disciplines. The approach that was used to link the disciplines was the theory of value chains by Michael Porter. We hold the opinion that there is a relation between cause and effect when productivity and quality of production or services is the subject.

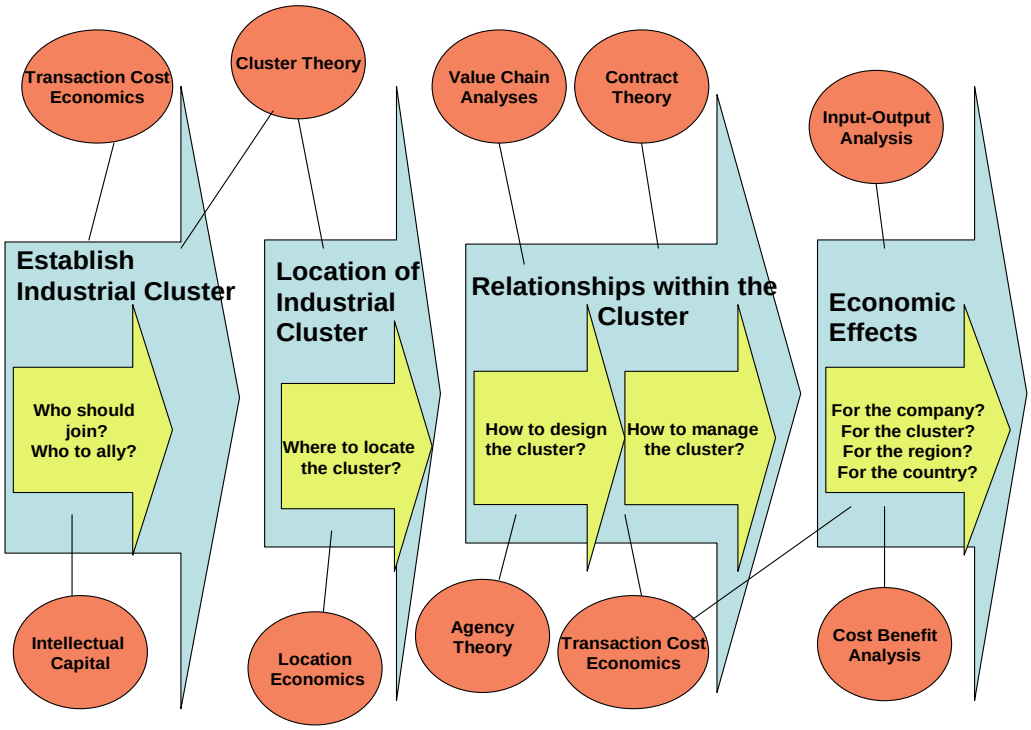
3 Creation of a Cluster

Enterprise development through the Phetogo Methodology is supplemented by an activity to encourage formation of agglomeration economies, through some level of cluster development. As mentioned, SINTEF is involved in a large scale research project on use of natural gas for industrial purposes in Norway, called GASMAT (short for Gas to Materials). One of the key objectives in GASMAT is to make a decision making model from the companies' point of view for:

- choosing well suited companies to the cluster

- finding a good location for the cluster
- designing a well functioning cluster
- calculating the economic effects of the cluster, for the companies, the local community, and for the region

This model was completed by the end of 2010. The framework of the model is illustrated in the following figure and briefly described below, in addition to further explanations in separate chapters.



The first step is to find out which other companies it is most useful for the given company to cooperate with in a new cluster. In other words: What kind of cluster and which strategic partners are required to maximise the benefits in terms of competitiveness and productivity? The next step is to examine alternative locations with a set of criteria that may vary for the different cluster participants. Land, infrastructure, labour, and raw materials are central factors when deciding the location for the cluster.

The third step is to look more seriously into what kind of relationships that should prevail between the companies within the cluster. Should they be formal and close, or more loose and informal? Should they be uniform, or vary between different categories of participating companies? How should the different relationships agreed upon be followed up and governed?

The decision making model deals with these issues, and includes a discussion on optimal design of the coordination and administration of the cluster as well.

Finally, when participating companies are chosen, the region for the cluster has been located, and relationships within the cluster are designed, it is time to estimate the economic effects for the companies, the cluster and for the region. The decision-making model from GASMAT yields answers to questions regarding these dimensions.

3.1 Who to ally?

When a company considers who to ally, it is necessary to check whether the potential company fits to its own business dimensions. That may be done by using Intellectual Capital Theory, which is a theory that analyses why the market value of a company is higher than the value according to the books of account. Of course the market value of a company has to do with expectations, and if the market value is higher than the value in the statements of accounts, the expectations of the company's future performance is quite optimistic.

But why does the market have positive expectations to a company? The company must consist of some valuable capital that will give high return in the future. It could be customer capital, innovation capital or process capital. A company could have loyal customers, and the market may think it will most likely get new customers. In such a case the company's customer capital would be of high value, which means that this capital wills most likely give the company good returns. Another reason for the optimistic expectations to a company could be that it is very good in introducing new production processes and new products. If that is the case, the company has a high value of innovation capital. The market could also have good expectations to a company due to very efficient production processes, which leads to low cost production without lowering the quality of the products. The company would then have process capital of high value.

When a company considers who to ally, it could analyse potential partners by looking into its customer capital, innovation capital and/or the process capital. Which of these business dimensions do fit and are of most interest? An in depth study of the potential company to ally could be done by analysing the most interesting capital unit.

3.2 Design of the alliance

When who to ally is more or less decided it is time to go more into how to design the alliance. In theories of Economic Organisations and Contract Economic are the main organisational options market, hybrid contracting and hierarchies (Williamson, 1985). Hybrid contracting is different

formal relationships like franchising and joint venture, while hierarchies are different legal entities, and market is use of the pure market mechanism for trade and transactions.

Theory of Economic Organizations is primarily based on Transaction Cost Theory and Agent Theory, in addition to Industrial Organizations (Brousseau, Glachant, 2008). These theories criticize the neo-classical assumptions of the "economic man" for being unrealistic, especially the suppositions that there are no conflicting objectives, there is perfect and symmetric information, and no transaction costs. Already back in 1937 Ronald Coase posed the question of why we observe different ways of organizing production: companies buy some products in the market, while other times they choose different kinds of long-term relations with other parties or they perform in-house production. What is the optimal size of a company? When is an organized cluster better than a pure market?

Instead of describing the firm as a production function the lens of contract describes the firm as a governance structure, and in this project the latter approach is used. Relationships within a company and relationships between companies are therefore the main focus, and make-or-buy, contractual structure, externality problems are consequently major keywords. Market failure and externalities are used as causes for establishing companies or organisations. Adaptation is the central challenge for an economic organization. Market enjoys the advantage of autonomous adaptation, but the advantage accrues to organisations for cooperative adaptation.

Total costs of production can be divided into production costs and transaction costs. Transaction costs can be decomposed in:

- motivation costs
- coordination costs

The first issue consists of cost of cheating or opportunistic behaviour, in addition to agency cost among owners, managers, and employees. The second topic is about cost of obtaining information, cost of coordinating production, and cost of measurement. Management and design of the alliance are therefore here in focus.

Oliver Williamson is the main person behind Transaction Cost Economics. He uses four perspectives to analyse whether the transaction costs are likely to be low, medium or high between companies in a value chain. These four factors are:

- Frequency
- Asset specificity
- Uncertainty
- Opportunism

The more there are of these four aspects, the higher are the transaction costs. More uncertainty needs more coordination, and the same could be said about high frequency of deliveries of goods or services. High degree of asset specificity means that the goods or the services are highly customised, which indicates high coordination costs as well. Opportunism is more about motivation costs. As mentioned will uncertainty have an influence on coordination costs, but in addition it would most likely have an impact on motivation costs as well.

If the transaction costs are low there is hardly any need for close collaboration between the companies in the value chain. With transaction costs on a medium level, a lower degree of vertical integration could be an option, and supply chain optimization could be used to minimize transaction costs. High transaction costs could be reduced by acquisition, because both coordination and motivation could then be easier to deal with. If the trading partner has a high score on some and maybe all the four mentioned factors for transaction costs, a formal alliance should be considered.

Opportunism means that each contract partner follows their own interest, and there may be conflicting interests between them. This is known as principal-agent problems, and the branch of Economics that deals with these problems is called Information Economics. Kenneth J. Arrow is well known for his involvement in Information Economics, where Agency Theory is a part. Agency Theory focuses on the relationship between the owner (principal) of the recourses and the manager (agent) for the same resources (Eisenhardt, 1989). There could be some disagreements for how these resources should be used, and the manager could give a wrong impression by hiding information and actions, and pretend that the business is run according to the owner's strategy and objectives. In other words difficulties could arise under conditions of incomplete and asymmetric information between a principal and an agent. For management and design of the relationships it is appropriate to use agency theory to analyse agency costs.

The principal would like the agent to work according to his objectives, which may be for example maximization of profits or maximum product quality given the price paid. However, the agent often has his own personal objectives, which may differ from the principal's for example to do the job with least possible effort. The problem arises because it is difficult to observe the goodness (quality) of the result. The principal may have little information concerning the effort that is made by the agent to fulfill the contract, i.e. information is asymmetrically distributed between contract partners.

Two major topics in Agency Theory are as already indicated hidden information and hidden actions. Incorrect information from the agent is hidden information, and lower activity and less initiative by the agent are hidden actions. Hidden information and hidden actions will give agency costs, and the more there are hidden the higher are the agency costs. An objective is to minimize the agency costs. Relationship between buyer and supplier, producer and customer, medical doctor and patient etc., may be described with agency theory, and with use of hidden information and hidden actions between these different types of the principal and the agent in the analyses.

3.3 Contracts

According to O. Williamson (2003) a firm should choose a contract that minimizes the sum of production costs and transaction costs. When transaction costs are high, they must therefore be weighed against the potentially higher production costs that in-house production may imply. For example there is reason to believe that a company producing its' own inputs are not capable of exploiting the capacity to the same extent as a specialized supplier in the actual field.

Note also that even in a situation with in-house production, there are still internal coordination and motivation costs for example as a result of employees or leaders following their own personal objectives. To minimize transaction costs it is necessary to establish a motivation mechanism not only between the companies of a cluster but between its leaders/ departments/ employees as well.

Parties will choose contract if the expected gains from doing so are greater than those of organising the transaction in some other way. Firms often combine formal and informal devices to govern their interfirm relationship, which means that the governance structures combine relational as well as formal elements (Beuve, Saussier, 2008). Whether formal and informal modes of governance structure are substitute or complementary, depends on the situation. Both formal contracts and relational contract must be taken into account when the design of the alliance is going to be done.

Reputation of the contracting parties reinforces their ability to implement relational coordination. But when the reputation level is not the same for both parties, formal and informal elements might be combined. Formal contract must be specified ex ante in terms that can be verified ex post by a third party. Because third party cannot enforce relational contract, it must be sustained by the value of the future relationship. Repeated interactions enhance trust between parties. Formal institutions do not produce trust but instead are a functional substitute for it. Intensive use of control mechanisms contractually provided tends to destroy trust between partners.

The formal contract will play an important role during the first periods of the relationships and thereafter will decrease in significance as partners cooperative behaviour and reputation emerge. Contract has to be seen as a generic framework on which firms will build and develop relational mechanisms in order to secure and adapt their relationships. Closer ties, norms and mutual understandings will be enhanced by long term agreements.

As soon as a relationship needs specific assets, firms will be watchful to select reliable partner in order to develop closer ties. A reputed firm will tend to protect it self by choosing a reputed partner as well or by contractually protect its reputation. Reputation might be interpreted as coordinating device sometimes more efficient than legal institutional mechanism. Relational contracting will be more easily implemented and sustainable when reputation is a stake as a hostage. When both parties put their reputation as a hostage we expect the relationship to be

governed through relational contracting mechanism. Reputation is crucial in implementing relational agreements.

Since the institutional framework is imperfect and incomplete, agents have to implement Interindividual Governance Structures (IGS) to achieve coordination. IGS is set up to complete the incompleteness of ex ante set contractual obligations and ensure their self-enforcement, in other words supervision device and arbitration mechanism that together ensure the self-enforcement of the contractual arrangements.

Incomplete contracts often implement behavioural principles, rather than a precise set of required actions. Behaviour-driving mechanism aimed at defining the actions that the parties have to undertake to efficiently achieve coordination. Standards and standardisation committees are examples of respectively private rules and private institutional organizations.

4 Institutional relations

Institutional relations is the third and remaining module or pillar in this project, while the two others are as described improvements in companies and creation of a cluster. It is essential to distinguish clearly institutions from organizations. Institutions are the rules of the game of a society or more formally are the humanly-devised constraints that structure human interaction. They are composed of formal rules (statute law, common law, regulations), informal constraints (conventions, norms of behavior, and self imposed codes of conduct), and the enforcement characteristics of both.

Organizations are the players: groups of individuals bound by a common purpose to achieve objectives. They include economic bodies (firms, trade unions, family farms, cooperatives); social bodies (churches, clubs, athletic associations); and educational bodies (schools, colleges, vocational training centers).

While the vast majority of decisions are routine some involve altering existing "contracts" between individuals and organizations. Sometimes that recontracting can be accomplished within the existing structure of property rights and political rules; but sometimes new contracting forms require an alteration in the rules.

Usually existing informal norms of behavior will guide exchanges, but sometime such norms will gradually be modified or wither away. In both instances institutions are gradually being modified. Modifications occur because individuals perceive that they could do better by restructuring exchanges (political or economic). The source of the changed perceptions may be exogenous to the economy, for instance a change in the price or quality of a competitive product

in another economy that alters the perceptions of entrepreneurs in the given economy about profitable opportunities. But the fundamental source of change is learning by entrepreneurs of organizations.

While some learning is a result of idle curiosity, the rate of learning will reflect the intensity of competition amongst organizations. Competition is a ubiquitous consequence of scarcity and hence organizations in an economy will engage in learning to survive. But the degree can and does vary. If competition is muted as a result of monopoly power the incentive to learn will be reduced.

Some fundamental characteristics of institutions:

- Institutions are made up of formal rules, informal norms and the enforcement characteristics of both and it is the admixture of rules, norms, and enforcement characteristics that determines economic performance. While the formal rules can be changed overnight, the informal norms change only gradually. Societies that adopt the formal rules of another society (such as some African countries' adoption of constitutions like that of the United Kingdom) will have very different performance characteristics than the original country because both the informal norms and the enforcement characteristics will be different. The implication is that transferring the formal political and economic rules of successful western market economies to African economies is not a sufficient condition for good economic performance.
- It is polities that shape economic performance because they define and enforce the economic rules of the game. Therefore the heart of development policy must be the creation of polities that will create and enforce efficient property rights.
- Evolving norms of behavior that will support and legitimize new rules is a lengthy process and in the absence of such reinforcing norms polities will tend to be unstable. We know very little about the evolution of belief systems and consequent informal constraints although religions have clearly been a basic component of belief systems.
- It is adaptive rather than allocative efficiency which should be the guide to policy. Allocative efficiency is a static concept with a given set of institutions; the key to continuing good economic performance is a flexible institutional matrix that will adjust in the context of evolving technological and demographic changes as well as shocks to the system.

The reference for the theory and the definitions about institutions and organisations above is Douglass C. North, 2005. In this project we study the impact of institutions both formal and informal on private sector development in general and improvements in companies in particular. How formal institutions and informal institutions can encourage to higher economic growth?

Our approach is from a bottom up point of view, which means that we study what kind of needs a company and a cluster of companies have with regard to formal and informal institutions. Which rules and regulations have a positive impact on commercial enterprise development? What about norms of behavior, beliefs systems and self imposed codes of conduct influence on

employees and employers attitude, motivation and loyalty? By interviews, observations and analyses on company level this project try to answer which elements of formal and informal institutions are crucial for further enterprise and private sector development.

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