

## A conceptual model for local content development in petroleum industry

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### ARTICLE INFO

*Article history:*  
Received March 8, 2012  
Received in Revised form  
April, 18, 2012  
Accepted 25 May 2012  
Available online  
May 31 2012

*Keywords:*  
Local content  
Petroleum industry  
Local policies  
Domestic industrial development

### ABSTRACT

A novel concept, local content, in oil industry is gradually emerging. Local content should be defined in terms of value addition in local country (by local staff, local materials, local services and facilities) rather than in terms of ownership of the company performing the value added activities. Many oil exporting countries have taken a positive approach toward local content development to maximize the benefits from oil and gas extraction. The purpose of this study is to develop a conceptual model for local content development in petroleum industry. Local content can generally be defined in terms of the ownership and/ or location of the enterprises involved in production and/ or the value-added in the production process. Local content promotion will have to vary significantly between countries, depending on the current status of their economic, political and social development. This model is useful for state governments to consider all aspects and factors affecting local content development generally. Local content development outcomes are economic growth, industrial growth and spillover effects. The paper begins with examining the factors accommodated in literature believed to influence the local content promotion. Based on our review, the conceptual model derived includes key factors of local content that evaluate local content development, and examine interrelations between local policies, local infrastructure, local environment, and local capability.

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## 1. Introduction

During the past 40 years, there have been significant structural changes in the oil industry. In the early 1970s, many international oil companies, supplied by a large number of independent service units, conducted oil exploration in both onshore and shallow offshore oil fields throughout the world. However, after some decades the oil industry developed non-traditional fields onshore and offshore, which required more sophisticated facilities and skilled labor. Since exploration and development of production facilities required a significant amount of investment, only large international enterprises were able to accomplish core oil and gas activities, while locally owned firms were mostly concentrated in non-core oil activities such as insurance and catering (Pastor et al., 2009).

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Over the last 40 years, developed countries like the UK and Norway have been successful in developing their local content. These developed countries have been active in both the upstream and downstream oil industries. Based on these successful experiences, other oil exporting enterprises have taken positive approaches towards local content development to increase the benefits from oil and gas extraction (Klueh et al., 2007). The primary objective of local policies has evolved from creating backward linkages, which is, supplying input to the local economy through transferring technology, creating local employment opportunities, and increasing local ownership and control. They also create forward linkages, which is, processing the sector's output prior to export through, for instance, the establishment of refineries, petrochemical industry, and the production of fertilizers (Tordo et al., 2011).

## 2. Literature review

Grossman (1981) is believed to be the first one who introduced the academic literature on local content. There are literally different reports devoted for the definitions of local content, which is a recognized term in the oil and gas industry. It can, generally, be specified in terms of the ownership and/or location of the enterprises involved in production and/or the value-added in the production process (Wells & John, 2008). Local content development in petroleum industry is a new concept, which has drawn academic attention in recent years. Therefore, there are limited numbers of academic works on this issue. During the past few years, various reports and papers have concentrated on local policies in various countries such as Norway, the Caspian Sea countries, Nigeria, etc. In Nigeria, researchers assessed the enabling environment for private sector development in the upstream

Petroleum industry recommended different ways of improving and increasing capabilities of Nigerian supply and services companies (INTSOK, 2003). Heum (2008) prepared a formal document on the experience from Norway in developing domestic industrial competence in conjunction with upstream oil activities. He claimed that Norway had been quite successful in this respect and it could be a role model for other resource-rich countries. Auty (2006) performed another attempt on improving the beneficial socio-economic impact of hydrocarbon extraction on local/regional development in Caspian economies and introduced four ways to maximize local contribution of hydrocarbon extraction projects. Ministry of energy of republic of Ghana released a report on local content and local participation in petroleum activities. This report explains policy context, policy goal, vision and policy framework, policy objectives, and policy directions of Ghana (Ministry of energy of Republic of Ghana, 2010). Klueh et al. (2009) investigated on various policies to improve the local impact of hydrocarbon extraction. They investigated the local content promotion in the oil industries of West Africa and Central Asia. They implemented a case study to devise a simple analytical model for rationalizing the selection of viable sectors for local content promotion. Their study demonstrated that many resource-rich countries had taken a proactive approach toward local content development.

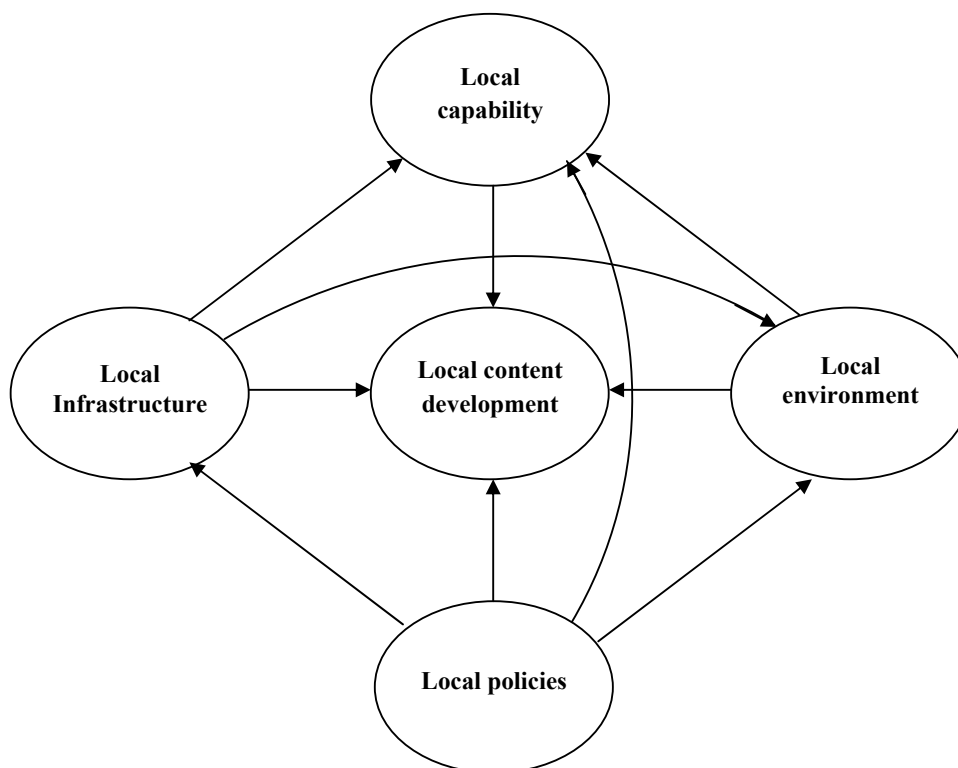
International organizations like the International Monetary Fund (IMF) and World Bank have published some general reports and conducted comparative studies on these policies. Based on these studies they have recommended some general guidelines for implementing local policies in different countries.

In this study based on aforementioned papers and reports, different factors affecting local content development are identified. Different issues in the literature are studied. A conceptual model is developed for local content development in the oil industry that shows the theoretical relationship amongst the factors affecting the local content. These factors will be clearly defined in terms of their respective variables. Similarly, the outcomes of local content development will be clearly defined and explained by their relevant variables.

### 3. Conceptual model

The development of a conceptual model for local content development in the petroleum industry has aimed to incorporate all important factors, which impact the development of the local content development. These factors have been adapted from the examined leading studies into the local content phenomenon with the objective of developing a model, which demonstrates the local content development in petroleum industry. Through a process of categorizing variables, taken from the previous studies, and conceptualizing their relationship with one another in the petroleum industry context a number of factors have been determined. Table demonstrates some categorized items. Variables are categorized into their relevant factors, namely, local policies, local infrastructure, local environment and local capabilities, which all impact local content development variables. They have not only been based on other studies but also on a conceptualization based on understanding local content and the petroleum industry. The structure and links between the model constructs have also been conceptualized based on some empirical understanding published in papers and reports; and therefore, it requires testing to confirm their appropriateness and validity. Fig. 1 illustrates the conceptual model on how the developed factors interact to create value for the host petroleum sector. As it is shown in Fig. 1, local content development is in the center and the four affecting factors have surrounded it. The hypothesized causal paths between each factor are depicted by arrows. Each of these causal paths is described later on in the paper.

The variables included in the local policies factor were found to have direct impact on local infrastructure factor variables. Therefore, the link from local policies to local infrastructure was drawn in Fig. 1. Similarly, the literature provided some evidence that the following causal relationships also exist:



**Fig. 1.** Conceptual model for local content development in petroleum industry

**Table 1****Factors and variable description**

Factors	Variable description
Local policies	Public policies
	Industrial policies
Local infrastructure	Information technology
	Local companies needs
	Standards
	Social infrastructure
	Educational infrastructure
	Institutional infrastructure
	Business development infrastructure
Local environment	macroeconomic environment
	investments and business environment
Local capabilities	Local companies capabilities
	Education
	skills and expertise development
	technology and know-how transfer capacity
Local content development	Research and development capabilities
	Economic growth
	Industrial growth
	Spillover effects

Although these links were investigated in the previous literatures, this does not indicate that all variables contained in each factor influences on every variable in another one, rather that the factor when considered as a whole has influence on another. Some of the relationships were not supported in the literature, and therefore their validity was intimately studied in both pilot and main studies. These links have been largely conceptualized based on an understanding of the local content concept and petroleum industry. For example, the effect of the local policies on local infrastructure is a good example of such a link, which has good theoretical background. Many enablers are determined as having potential to influence on the promotion of the local content process and have been categorized into four main groups: local policies; local infrastructure; local environment; and local petroleum industry capability. The performance and inter-relationship among these local content factors contribute to the degree of promoting local petroleum sector. The benefits of local content development can be extracted from three main areas including economic growth, industrial growth, and spillover effects. The following sections explain the persuasion on why every variable in the aforementioned factors and local content development are included.

### *3.1. Local policies*

Local policies are concentrated in a range of economic sectors including oil and gas industry. These policies include public and industrial policies, which are concerned with sustainable economic development. The public inputs to any production process tends to require a number of coordinated policy reactions, so they are often more extensive than assumed (Hausmann & Rodrik, 2006). Even highly developed economies rely on active policies to increase the local content generated by local manufacturing and services companies (Klueh et al., 2009). These policies will general a more forecasted macroeconomic environment, increase the reliability of institutions and the legal system, provide incentives to enhance sound business practices, generate a more enabling infrastructure for business development, and enhance social structures, which would contribute to inclusion and participation (INTSOK, 2003).

Heum (2011), argued that a local content policy must be outlined with cautious considerations to shun damaging the opportunities for business development outside the oil sector. If a policy is to be successful in augmenting local content in the oil and gas activities and subsequently enhance industrial development, decision makers at all levels are required to share the objective of making contribution to national wealth through industrial growths (Heum et al., 2011).

Public policies can execute different functions such as establishing company registries, appointing norms, enforcing contracts, laws and strategies, and providing infrastructure aligned with planned local content objectives. It is necessary for the government to increase local skills, business know-how, technology, capital market development, wealth capture, and wealth distribution to create the conditions for domestic companies to emerge (Tordo et al., 2011). Government policies have to lead to cooperation between government and firms in the decisions regarding local purchasing and subsidies. This cooperation is likely to propel the economy into a better conditions of welfare (Veloso, 2001). In order to monitor the process, clear indications given by the policy as to how growth and improvement of local content will be accounted and communicated to each company (Nwokeji, 2007). Industrial policy constitutes a vital part of government policies. Industrial policy has to primarily focus on the efforts, which could facilitate the participation of locally owned firms in the domestic petroleum activities, competitively. UNCTUD recommends in its 2001 report that promoting industrial linkages among domestic recourses and international investors in undertaking business activities in the country will enhance industrial development.

Based on the literature reviewed in this section it can be concluded that political factor is the most important macro factor which affects the local content development directly or through other factors like environmental, local capabilities and infrastructure factors. This variable (public policies and industrial policies) has been adopted from the previous studies (e.g. Klueh, et al., 2007, INTSOK, 2003, Nordås, et al., 2003, Heum, et al., 2011 and Auty, 2006) and incorporated into the conceptual model.

### *3.2. Local infrastructure*

The availability of certain conditions such as information technology, local company's needs, standards, social, educational, etc. in the local petroleum industry is the primary concern of local infrastructure factor. Because providing and maintaining the necessary infrastructure would add to higher level of social welfare, it is essential for local supply industry to be more competitive. IT infrastructure is definitely an important variable, which has a substantial impact on local content development. It is necessary for information dissemination, which is one of important policy principles, to foster local content in the oil industry (INTSOK, 2003). Klueh, et al. (2007) recommended the establishment of a public outreach and analysis office to (i) develop a registry of competent and qualified local vendors, (ii) advise locals on potentials for joint ventures and other mechanisms of cooperation with foreign companies, and (iii) support plans for local capacity building, training, and R&D. For example, major oil companies have jointly introduced portals for e-commerce, such as Trade Ranger, owned by 15 oil and petrochemical companies including BP, shell, TotalFinaElf and Statoil, and it has at present more than 1000 supplier members.

The collaboration between the government of the host country and the major players in the petroleum activities ought to be focused on how to involve domestically-based companies with local labor. Attention must be on how to facilitate their participation in the domestic petroleum activities without compromising quality, health, safety and environmental standards (Heum et al., 2011). Public utilities like roads, railways and air transport, telecommunications, electricity and water supply as business development infrastructure can create an environment, which enables for business development and productivity. The standard of this infrastructure will influence profitability considerations for

investors (INTSOK, 2003). Social infrastructure is associated with social cohesion between different social groups, which reduces the chances of social disorder. A stable environment attracts foreign investments and contributions to technology transfer (Heum et al., 2011).

### *3.3. Local environmental*

Next factor is local environment in which all local policies, local capabilities, local infrastructure and the interaction among these factors are formed. One of the important variables is the macroeconomic environment, which is decisive for the factors, which are necessary for any investment decisions such as development of domestic prices, the exchange rates for the local currency, and the interest rate. Some particular government policies impact the environment for investments and business development. Encouraging competitiveness develops competitive oil and gas based industry. This environmental context is essentially the same for any country with ambitions to develop oil-related businesses (INTSOK, 2003). For instance, in the early 1990s: the UK's government in the context of a strengthened relationship with the European union, moved its focus from promoting local content within the UK offshore oil and gas industry to help private investors develop export markets in a competitive environment (Klueh et al., 2009).

The recent country analyses and papers specify that to prevent the pitfalls of resource abundance, the countries must proactively establish a sound institutional structure and macroeconomic management (IMF, 2006). It is necessary to make sure that the leading international firms continue to choose to participate in the domestic industry, because local content requirements identified in other industries seem to create a business environment that is most attractive to less efficient, high-cost investors. This is because the less efficient have the lowest switching costs, i.e. They have less to lose from selecting more expensive suppliers than more efficient producers (Heum et al., 2011).

### *3.4. Local capability*

Local capabilities include education, skills and expertise development, transfer of technology and know-how and an active research and development portfolio within manufacturing and services of local companies (Ministry of energy of Republic of Ghana, 2010). Industrial growth is not something, which could be decided by politicians but it is a result of demanding interplays between established and emerging industrial capabilities (Heum et al., 2011). Developing local content in the petroleum sector must be based on existing capabilities within manufacturing, fabrication, and services. In other words, successful strategies determine which existing products and services the country can generate profitably. However, many countries maintain a weak industrial base and local policies commonly maintain some measures, which permit for the preferential treatment of domestic companies (Tordo et al., 2011). According to Nordås (2003) local policies have to appreciate and encourage foreign firms to collaborate with local companies. In turn, this should be expected to give impulses and create dynamics, which would have positive influence on the development of indigenous firms.

Industrial development is a learning process, where capacity and capabilities expand through a process of solving challenging tasks in collaboration with internationally leading competence (Heum et al., 2011). Auty (2006) studied the importance of learning in the industrial development and explained that presence of learning impacts benefits both the investing firm and the local economy. An effective educational system is crucial to improve the learning capacity (NWOKEJI, 2007).

In order to improve the local skills and capabilities and narrowing the technology gap between domestic and foreign companies, there must be an industrial infrastructure to build on (INTSOK, 2003). In Ghana, the local training and technical institutions are supported by both government and petroleum operators to develop the necessary capacity to train Ghanaians to higher levels required by

the industry in drilling and support services, marine, catering and housekeeping, supplies and other support services (Ministry of energy of Republic of Ghana, 2010). The importance of adoption is essential because maybe the inputs from host is not the same as for those the equipment was designed. The ability of any company to absorb the advanced technology depends on the organizational and technical capabilities of the company (Cusumano & Elenkov, 1994).

Third world countries need to develop their technological capacity, but the abilities of these countries is limited by their reliance on low level of absorption of technology (Kumar et al., 1999). Recent research by Escribano, et al. (2009) suggested that the capacity for absorption is in fact a source of competitiveness. In other words, absorption capacity of the local company plays a crucial and important role in technology transfer process.

### *3.5. Local content development*

The level of local content development depends entirely on the quality of relationships among political, infrastructure, environmental and local capability factors and the results are economic growth, industrial growth and spillover impacts.

Local content will make its contribution effectively to the host country economy by creating and developing value added activities and competitiveness by international standards. The past experiences of economics of many developed and developing countries indicate that linkages between the primary resource sector and other sectors impact economic growth, significantly. Thus, if the linkages are strong enough such as when inputs are not supplied from abroad, the economy gradually becomes diversified (Heum et al., 2011).

The implementation of local policies to encourage economic diversification and the development of reliable backward linkages is necessary, because they are considered as a tradeoff between short-term efficiency and long term economic development (Tordo et al., 2011). There is no guarantee that ambitions and endeavors to incorporate local content actually will benefit the development of the host country economy. Nordås et al. (2003) investigated the experience from oil and gas projects in six countries and clearly disclosed that if the policy to enhance local content is not enforced properly, it may have some bad impacts on the economic development of the host country.

Industrial growth is the second impact of local content development and it is also an industrial task, which offers opportunities for the oil industry to strengthen profitability from its operations in host countries with huge oil and gas resources. In essence, any discussion based on industrial growth, including impacts to generate growth by increasing local content in goods and services required to extract oil and gas needs investments. Investments are necessary to expand capacity and capabilities, which are necessary in the generation of industrial growth. Therefore, it is in the petroleum sector, as in the non-petroleum sector of the economy. In addition, it is for indigenous firms to expand, as for foreign companies to establish facilities for manufacturing and service production, locally. It is also a requirement to succeed with a policy in enhancing industrial development by increasing local content in the local petroleum activities.

Besides, we must make sure that all levels in the society share the goal of pursuing a policy, which would contribute to national wealth through industrial growth (Heum et al., 2011). Spillover is considered as another local content development influence where local content development will more highly spin off positively to industrial development in other areas of the economy as well, that is, industrial sectors other than oil and gas based industries should take advantage. Local content in the petroleum industry should not be seen as an end in itself. It is a technique to develop businesses,

which could compete for contracts in upstream oil and gas, in domestic and abroad, which may have positive spillovers even to non-petroleum based industries (INTSOK, 2003).

#### 4. Methodology

Research conceptual model presents critical factors of local content development. According to proposed model, authors represent the main hypothesis as:

- H1: There is a positive relationship between Local policies and Local content development.
- H2: There is a positive relationship between Local policies and Local infrastructure.
- H3: There is a positive relationship between Local policies and Local environment.
- H4: There is a positive relationship between Local policies and Local capabilities.
- H5: There is a positive relationship between Local infrastructure and Local content development.
- H6: There is a positive relationship between Local environment and Local content development.
- H7: There is a positive relationship between Local capabilities and Local content development.
- H8: There is a positive relationship between Local environment and Local capabilities.
- H9: There is a positive relationship between Local infrastructure and Local capabilities.
- H10: There is a positive relationship between Local infrastructure and Local environment.

##### 4.1. Data collection

Data collection for this study was undertaken with Iranian petroleum professionals. The target groups of respondents are technicians, engineers, supervisors, managers of departments of the Iranian petroleum industry. As expected, it was difficult to determine the adequate number of sample participants for this study. However, this process made use of available statistics on the NOC<sup>1</sup> and statistics of the Iranian petroleum companies available. Furthermore, counseling with professional academics in the relevant statistical researchers. 100 questionnaires were distributed and 38 completed responses were received, i.e., 38%. For content validity of questionnaire, related academic professors, experts, and specialist and Iranian petroleum experts were consulted and they confirmed the feedbacks. For assessing the internal consistency of the questionnaire, the Cronbach's Alpha was used that is obtained 0.75, which is well above the minimum required level.

##### 4.2. Data analysis and results

###### 4.2.1. Rating Local content development variables

As previously described, the questionnaire respondent rated the impact for the retained 19 items on a five-point Likert scale for the Local content development. Table 2 details the mean and standard deviation value for each variable in the conceptual model. The significant outcomes of this analysis are summarized below:

- The local policies mean (4.2) was considered the most important local content development enabler, followed by local capabilities (4.08). Local environment (3.89) and the local infrastructure construct (3.87) were not considered as important as the others were.
- The public policies mean (4.4) was considered the most important variable. Education (3.8) and the social infrastructure (3.76) were considered the least important enabling variables.
- Most of the Local content development variables were deemed highly and equally important.
- The variables within all constructs were considered important (mean > 3); therefore, 19 variables of impact perspective were used for more statistical analysis.

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<sup>1</sup> National Oil Company



**Table 2**  
The mean and standard deviation value for each variable

Variable description	Mean	Standard Deviation
Local policies	4.2	0.669
Public policies	4.4	0.879
Industrial policies	4	0.787
Local infrastructure	3.87	0.876
Information technology	3.82	0.688
Local companies needs	3.81	0.765
Standards	4.02	0.833
Social infrastructure	3.76	0.748
Educational infrastructure	3.98	0.687
Institutional infrastructure	3.88	0.689
Business development infrastructure	3.91	0.672
Local environment	3.89	0.841
Macroeconomic environment	3.98	0.621
Investments and business environment	3.81	0.819
Local capabilities	4.08	0.762
Local companies capabilities	4.2	0.873
Education	3.8	0.764
Skills and expertise development	3.99	0.714
Technology and know-how transfer capacity	3.95	0.601
Research and development capabilities	4.10	0.761
Local content development	3.97	0.832
Economic growth	3.98	0.716
Industrial growth	4.02	0.813
Spillover effects	3.094	0.747

#### 4.2.2. Determine the relationship among research factors

In order to determine the relationship among research factors, Pearson correlation was utilized and the results are summarized in Table 3.

**Table 3**  
Summary of research results of hypotheses

Hypothesis	Coefficient of correlation	t-value	Results
H1: There is a positive relationship between Local policies and Local content development.	.83	8.9	Accepted
H2: There is a positive relationship between Local policies and Local infrastructure.	.67	5.4	Accepted
H3: There is a positive relationship between Local policies and Local environment.	.46	3.1	Accepted
H4: There is a positive relationship between Local policies and Local capabilities.	.76	7	Accepted
H5: There is a positive relationship between Local infrastructure and Local content development.	.56	4	Accepted
H6: There is a positive relationship between Local environment and Local content development.	.63	4.8	Accepted
H7: There is a positive relationship between Local capabilities and Local content development.	.79	7.7	Accepted
H8: There is a positive relationship between Local environment and Local capabilities.	.58	4.2	Accepted
H9: There is a positive relationship between Local infrastructure and Local capabilities.	.39	2.5	Accepted
H10: There is a positive relationship between Local infrastructure and Local environment.	.35	2.2	Accepted

\* $\alpha=.05$ ,  $t_{\alpha/2,(n-2)}=1.96$  Level of confidence =0.95

As indicated in Table 3, there was a direct and significant relationship between local policies and local content development ( $r=0.83$ ), local policies and local infrastructure ( $r=0.67$ ), and local policies and local environment ( $r=0.46$ ). In addition, there were direct and significant relationship between local policies and local capabilities ( $r=.76$ ), local infrastructure and local content development ( $r=.56$ ), local environment and local content development ( $r=.63$ ), local capabilities and local content development ( $r=.79$ ), local environment and local capabilities ( $r=.58$ ), local infrastructure and local capabilities ( $r=.39$ ), local infrastructure and local environment ( $r=.35$ ). In addition, t-value for the

hypothesis is as follows the result of t-value rejects all of null hypothesis, which specifies there is a meaningful relationship between research factors when the significance level is five percent.

## 5. Conclusion

A model was formulated to help both researchers and practitioners better understand the concept of local content and its development in petroleum industry. With some modifications, these factors became essential components in building the developed conceptual model. This model is consisted of a set of factors: local policies, local infrastructure, local environment, and local capability affecting local content development. This model can be a very useful checklist for policy makers in different countries. The level of each variable in the examined factors may be assessed for different countries. This does not mean that implementing this simple model in every country can lead to full promotion of local capacities. Local content promotion varies significantly between countries, depending on the current status of their economic, political and social development. Local content development is a challenging task, and agencies, facilitators and politicians should be encouraged to learn how things work, and to strive for continuous and incremental improvements. The only thing that is crucial is to stay dedicated to the task of capacity building. Maximizing the benefits of local content is not the same as maximizing local content.

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