Knowledge Diffusion in the Tegal Metal Working Industry
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The initial phase of the RICA project has four components: the Rural Investment Climate Survey, National Conference on the Rural Investment Climate, and five case studies that complement the quantitative survey with qualitative research. The case studies were designed to increase understanding of the policy and institutional setting and how it influences the failure or success in implementation and outcomes. The RICA Case Studies were chosen around five themes where knowledge gaps exist or where good examples of innovation have been found. The knowledge gained from these case studies will be incorporated into the RICA Report.

For more information on the RICA project, please refer to www.worldbank.org/id/rica.
Case Study 3:
KNOWLEDGE DIFFUSION IN THE TEGAL METALWORKING INDUSTRY

ABSTRACT
The two main sources of knowledge diffusion in the Tegal metalworking industry are private enterprises subcontracting to local business and the local government. The large private enterprises provide technical training to a limited number of larger workshops who, in turn, provide limited learning benefits to smaller subcontracting workshops. Limitations to this kind of knowledge diffusion are that smaller workshops are largely excluded from this training and that the training does not enable larger workshops to improve their skills or use of technology more broadly to produce more complex and/or higher added-value components.

Though well-intentioned, government training has produced minimal measurable results to date and many firms complain that it does not target their needs. The local government’s training has had a limited positive impact in the sense that it provides assistance to firms that would otherwise not receive any help at all and that it covers areas not addressed by private sector enterprises such as management. Efforts to lower information costs and promote marketing linkages have achieved limited tangible results to date, though some metal workshops have received subcontracting orders due to government assistance. Government efforts to develop supporting institutions, including a laboratory and a polytechnic, have had some promising results though it is too early to draw conclusions regarding the success of this approach.

INTRODUCTION
One of the characteristics of rural non-farm enterprises (NFEs) is that they often appear to have much lower productivity than larger, urban-based enterprises. In fact, the productivity of rural enterprises may be much higher than labor productivity measures may suggest. Such figures suggest that there could be dramatic gains in productivity and incomes were it possible to improve the technological capacity of rural non-farm enterprises. However, programs to boost the technical capacity of small enterprises in many countries, including those in Indonesia, have often been largely unsuccessful. In Indonesia, this is often due to inappropriate targeting of training, a lack of budget for managing and maintenance of the Technical Support Units (UPT), and lack of qualified trainers. A key lesson from these studies is the importance of understanding how NFEs can best obtain and utilize appropriate types of technical knowledge and how government can promote these knowledge pathways.

The District government has mapped out on an ambitious agenda to improve its investment climate by boosting the technical and managerial capacity within the metalworking sector, specifically targeting firms creating parts for the ship building and automotive industries. Thus, the central issues addressed in this study are the ways in which metalworking industry workers can access...
technical and managerial knowledge, the successes and limitations of the local government’s role in that process, and underlying reasons for these outcomes.

Section 2 provides background information about Tegal district and the key actors involved in the metalworking industry, and the methodology employed by the case study team. Section 3 then summarizes and analyzes the existing flows of technical and managerial knowledge within the sub-sector, whilst Section 4 describes the nature and role of government policies in supporting the development of technical capacity. Section 5 concludes with a summary of key findings and suggestions for concrete strategies that the local government might consider to enhance technical knowledge flows to local metalworking firms.

Issues Investigated include:

1. Are government-led knowledge diffusion initiatives less successful than private firms’ training efforts?
2. Are larger metalworking enterprises more likely than smaller firms to adopt new technologies?
3. Is the local government motivated to improve the skills of metalworking firms in Tegal?

TEGAL DISTRICT

Tegal District is located near the north coast of Central Java on key trucking and rail routes. Major industries in the area include processed food (tea and tofu), textiles (batik and embroidery) and furniture (bamboo and wood). The District generates 22.09% of its annual income from the industrial sector, compared with 24.24% and 24.62% from its trade and agriculture sectors respectively. The remaining 29.05% of District income comes from Service (10%), Financial Services (7%), Construction (4%), Transport (4%), Mining (2%), Water and Electricity (1%).

The district has a population of 1,423,346. Total employment in the local metalworking industry is 30,029 or approximately 25% of the 118,820 workers employed in the District’s industrial sector. Local government estimates there are 2,811 metal workshops in the district.

Most of Tegal’s metal workshops rely on the same basic metalworking technologies. Their comparative advantage has been in filling small orders for simple metal products or components. The small size of workshops gives them greater flexibility and Tegal’s abundant cheap labor can outweigh the productivity advantages of more capital-intensive production. There is often intense price competition between workshops.

The district government calls groups of geographically proximate metal enterprises producing for the same sub-sector (such as ships or autos) sentra, and tries to develop selected sentra into larger...
clusters. Thus, when local government talks about cluster development strategies it is talking about turning sentra of about 30–100 workshops into these more advanced clusters.

Tegal has been a metalworking center since the mid-1800s when it was the locus of several sugar processing factories and related enterprises including locomotive repair shops and metal processing factories. The industry continued thriving particularly under the New Order’s massive infrastructure and development agenda. In 1981, the first subcontracting activity started in the District, sparking government activity to develop the metalworking industry.

**LOCAL ACTORS**

**Workshops**

*Inti:* An inti is a larger, more sophisticated workshop employing anywhere from 20–100 workers. Intis receive orders for metal components from large enterprises outside the District. While most workshops prefer to diversify their income, some workshops derive all their income from subcontracting work. Inti often subcontract some of their orders to smaller workshops or plasma.

*Plasma:* Smaller, usually cottage or household, workshops. Plasma workshops usually hire cheap, unskilled labor and the owner passes basic metalworking skills on to the employees, leaving the technical capacity of the workshop highly dependent on the technical capacity of the owner. Plasma are often subcontractors to inti.

Some workshops manufacture entirely for the retail market. Goods from these workshops are sold to domestic market suppliers (see below) or directly to local consumers rather than through subcontracting channels. Often, inti and plasma workshops also manufacture for the retail market.

*Sentra:* Groups of geographically proximate metal enterprises producing for the same sub-sector. Sentra are the focus of government development strategies for the metalworking industry in Tegal.

*Large Enterprises:* These are private sector firms subcontracting work to Tegal metal workshops. Most prominent among them is PT Komatsu, but divisions of the Astra Group also subcontract in Tegal, including PT Sanwa, PT Katshusiro, PT Hanken, PT Natra Raya, PT Sowa, PT Kubota, PT Polytron, PT Fiar Motor, PT Nefa Global Industri. and Daihatsu also subcontract in Tegal. These firms often source metal components from several parts of the country, mostly in West Java.

PT Komatsu Indonesia Tbk is a subsidiary of a Japanese firm that has subcontracted orders to Tegal metalworkers since 1998. PT Komatsu manufactures construction and mining equipment under the global trademark of Komatsu. Their product line includes hydraulic excavators, bulldozers, motor graders, off-highway dump trucks as well as frames and related components and steel cast products.

While there is no data on what percent of total metalworking firms sales comes from subcontracting, the figure is a substantial amount given that large inti derive a majority of their income from sub-contracting work.

*Wholesalers and retailers:* purchase goods directly from metalworking shops for resale in stores in Jakarta and other cities in the country.
Government organizations

BPPT: The Indonesian Agency for the Assessment and Application of Technology is a non-departmental institution established in 1974 under the National Ministry for Research and Technology and is tasked with implementing the government's role in the study and application of technology.

The District Industrial Affairs Sub-Agency: A division of the Department of Industry, Trade, Investment, and Cooperatives active at the District level, it works to find ways to improve the performance of/develop major industries.

This department established the UPT LIK (Technical Services Unit for Small Industry) in 1982. The UPTD lab followed in 2001 to assist workshops with subcontracting orders by providing access to technological processes and machinery otherwise not available to workshops. In 2003, the government revamped another institution to form the Center for Technological Assistance and Innovation or PPIT. PPIT was a District-level, government-run center that attempted to assist industry with technological process, management and marketing. In 2004, the PPIT was dissolved into the UPTD Lab and UPT LIK and Showroom.

DPDS: The Regional Competitiveness Board is a small forum attended by NGOs, small enterprise owners, and local government officials (bureaucrats and elected local legislative officials) where there is open policy discussion about what can be done or what is being done to improve the business environment for local enterprise.

Methodology

During two-weeks of fieldwork in Tegal District, the team of three researchers visited Adiwerna, Talang, Desa Kebasen, and Desa Dampyak. Thirty-four respondents were interviewed including government representatives, owners of inti, plasma and retail manufacturing metalworking firms, large enterprises, domestic wholesalers and retailers, and NGOs.

Structure of the Tegal Metalwork Value Chain

The research focused on clustered metal workshops in the automotive and shipbuilding sub-sectors. The team spoke with PT Komatsu representatives, and held two focus group discussions and ten semi-structured interviews with government officials to discuss government-led knowledge diffusion initiatives and the history of subcontracting linkages in the District. Extensive, semi-structured interviews were conducted with representatives of PT Komatsu's local subcontractors including three of the four intis filling

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7 BPPT: Badan Penerapan dan Pengembangan Teknologi Indonesia
8 PPIT: Pusat Pelayanan dan Inovasi Teknologi
9 These two sub-sectors were selected by the local government for intensive assistance based on existing competency in terms of access to “key markets”, quality management systems, and able and willing to cooperate with other workshops.” Interview with Pak Dasuki, Head of Industrial Affairs Sub-Agency, September 29, 2005.
subcontracting orders directly to Komatsu and with the plasma workshops that subcontract from Komatsu’s inti.

The team held a focus group discussion in Kebansen Village with ten local workshop owners to discuss the needs of their businesses as well as government and private sector trainings received in the last five years.

Are government-led knowledge diffusion initiatives less successful than private firms’ training efforts?

Private training initiatives led by large firms have proven to be the most successful method of efficiently transferring specific, relevant technical knowledge to selected inti workshops. While government led initiatives attempt to cover a broader range of workshops, and with more topics, this did not result in the efficient transfer of high-quality, usable knowledge to inti workshops.

In Tegal, three kinds of knowledge pass between providers and receivers: technical, managerial, and marketing. Tegal District’s major external knowledge providers are local government, large enterprises like PT Komatsu and—to a much lesser extent—domestic retail market suppliers. Domestic retail suppliers can inform metal workshops about consumer preferences, demand, and new innovations. One wholesale/retail dealer interviewed stated that he created new products and commissioned them from the small workshops. Generally, retailers emphasize low cost over quality. Internal networks are composed of relationships among the workshops themselves.

The main source of knowledge diffusion is technical and managerial training provided by large enterprises to their subcontractors. To access this, however, a workshop must have attained a certain level of technical and managerial capacity. Larger metal workshops in Tegal District are more likely to adopt new technologies in their bid to become subcontracting inti to large enterprises. By building upon existing technical and managerial capacity, larger workshops are able to enter a virtuous circle where quality output leads to subcontracts which leads to private training from subcontractors.

Though a combination of reputation and personal connections are important10, large enterprises want proof that a workshop has the capacity to produce high quality components. An audit determines if the workshop has the required machinery, manpower11, facilities, legal standing12 and use of ISO standards.13 The potential subcontractor is then requested to produce a sample component from provided technical drawings. Before an agreement is signed, large enterprises will

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10 In the case of PT Komatsu’s subcontracting inti, personal networks were critical for at least three of the four in having accessing to market knowledge that assisted with their successful bid to become subcontractors. All interviewees have insisted that the opportunity to become a Komatsu subcontractor was open and based on workshop capabilities.

11 Capability to have two shifts for higher productivity

12 Most large enterprises require their subcontractor’s to be a P.T. (Limited Liability Company) not a C.V. (a Limited Partnership not involving a legal person and personal assets are liable for obligations).

13 Large firms require the use of ISO standards even if the workshop is not officially certified.
often ask for a trial run of the mass production process, subjecting the output to quality control tests.\(^{14}\)

Komatsu says they have periodically opened competition for new inti. Three inti candidates tried but failed to fulfill their quality requirements. The team noted that Komatsu’s existing inti offer a better alternative—that is, they already have years of training (saving cost), a proven track record, and are capable of expanding their capacity through taking on more plasma. Existing inti acquire new subcontracting links through recommendations and business networks of their current large enterprise clients, but have had little success marketing themselves to large enterprises without this link or without government intervention.

After winning a contract, an inti subcontractor has access to a significant level of technical training. According to a sub-contractor of PT Komatsu, trainings directly addressed the technical needs of the workshop in meeting the production requirements of Komatsu. Indonesian experts from the Jakarta Komatsu office leading the training used a teaching style that clearly delivered the necessary knowledge and emphasized practical application, with 90% of training time spent in hands-on experience. Trainers also help the workshop identify problems and troubleshoot.

Another workshop owner emphasized the practical, direct nature of the technical and managerial training his inti received from Astra Agro Industri, “Problem A is immediately given Solution A. There is no mediator, it’s all through direct communication leading to direct responses and problem solving, and we are able to hear the consumer’s input and complaints.”\(^{15}\)

This style of knowledge diffusion has two important limitations. It focuses training on larger inti workshops, with smaller sub-contracting firms benefitting only indirectly, or, in the case of small retail market firms, deriving no benefit at all. Also, large enterprise training does not seek to develop the inti workshops capability to rise beyond their capacity as low-cost production centers for selected components.

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**Are larger metalworking enterprises more likely than smaller firms to adopt new technologies?**

Larger firms have both greater opportunity and greater incentive to adopt new technology. Their relationship with large enterprises provides them access to training and incentive to create higher quality goods. Plasma workshops’ opportunity and incentive are significantly lower, unless they have a solid subcontracting relationship and are the beneficiary of knowledge spillover. Plasma working the retail market depend largely on un-targeted, irregularly publicized government programs, which may not be suit their needs. Strong competition among retail suppliers inhibits knowledge transfer and encourages production of low-quality, inexpensive products.

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\(^{14}\) Interview with Pak Dwi Wanto, owner of inti workshop August 31, 2005.

\(^{15}\) Statement from Pak Ali Mustaqim, owner of a small retail market workshop in Focus Group Discussion on September 3, 2005
Knowledge flows to plasma

Knowledge flows to smaller firms operate in a different manner. Compared with inti, most small firms lack the technical ability to produce complicated components with the precision required by large enterprises, thus making it unlikely they will receive sub-contracting orders directly from these companies. Small workshops selling to the retail market or to domestic market suppliers sell a limited range of simple final products such as pulleys, ship windows, and basic auto parts. While domestic market retailers may demand a sample product, there is much less emphasis on precision. Small workshops often use second-hand or homemade equipment. They hire low-skilled, low-wage workers with little or no experience and rely on shop owner’s technical knowledge. Since many small workshop owners built their expertise through working in small shops and rarely have formal academic training, they have difficulties reading technical drawings and instead rely on copying samples (often worn), leading to less accurate output.

Small workshops do not have incentives to specialize or purchase expensive machinery because they fill many types of small orders, and depend upon inexpensive semi-skilled labor. As one seasoned metal worker explained, the strength of the smaller workshop is the flexibility to do smaller orders. However this flexibility can also be a liability, as workshops must fill many small orders, and thus never develop a specialization that would result in stronger technical skills.16

Though less direct, the subcontracting system does provide some market opportunities for small enterprises to benefit from the virtuous circle affecting inti capacity building. Subcontracting plasma gain from the incentive to produce higher quality for a higher price with technical coaching from inti clients in their own virtuous circle.

Inti respondents for auto components turn to smaller plasma workshops to produce 10–15% of their orders from large enterprises, usually components of components or basic parts made more cheaply in small workshops while still passing the quality control requirements of large enterprises. Often soft loans are provided to plasma to help them acquire new machines capable of higher quality output. Inti and plasma involved in subcontracting are more likely to use the UPTD Lab, especially to test the quality of materials.17 They are more able to offset lab usage costs through the higher price paid by large enterprises for quality parts.

Learning takes place through quality control as inti often build a procedure for troubleshooting mistakes into their subcontracting relationships.18 Inti workshops engage in coaching plasma on quality control standards, and, in some cases support former employees already familiar with these standards in starting up plasma.19 A plasma subcontractor for KPY, one of PT Komatsu’s inti, explained that his company received useful technical coaching as part of a quality control process conducted upon delivery of his product to KPY.20 In a case of knowledge spillover, his firm applied some of these technical lessons not only to his subcontracting operations, but also to the production of retail market goods.

Competition and lack of cooperation inhibits knowledge diffusion

Workshop proximity does not automatically generate the social capital needed for good cluster development. While positive experiences in intra-cluster cooperation builds new levels of social

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16 Interview with Pak Urip, small retail market workshop owner, September 3, 2005. Also interview with Pak Drajat Samyono, head of UPTD Lab on machinery usage.
17 This process requires machines and expertise too expensive for the workshops to internalize. Interview with Pak Drajat Samyono, Head of UPTD Lab, August 30, 2005
18 Interview with Pak Dwi, owner of an inti workshop, August 31, 2005, see also interview with Pak Agus, factory manager for an engine manufacturer, August 30, 2005.
19 Former employees own 70% of PT Milakko’s plasmas.
20 Interview with Pak Amirudin, owner, September 13, 2005.
capital and increases the cluster’s potential to engage in future higher value production, intense competition between non-specialized firms can have the opposite effect, inhibiting knowledge diffusion.

Knowledge transfer between small workshops in Tegal’s metalworking industry is often contingent on personal networks and conditioned by competition. Workshops producing for the retail market described competition as heavy, sometimes becoming “unhealthy competition,” for example when a competing firm bought off a shop owner’s driver after a marketing trip and followed up with lower bids to the same potential clients. Many workshop owners were worried about firms’ tactics to reduce production costs, often at the expense of quality. Some workshops find the right combination of cheap scrap metals to get their products to pass buyers’ inspection standards, but these lower quality items wear out more quickly and do little to strengthen the reputation of the Tegal metal working industry as a whole. This cost cutting in turn creates price pressure forcing competing workshops to a race for the bottom in terms of quality.21

Small workshop respondents mentioned that there was hesitancy among metalworkers to share new and possibly advantageous technical knowledge.22 If shared, technical knowledge was shared amongst personal friends whose shops were not in direct competition. The same hesitancy was seen in giving too much training to employees. Ex-employees were likely to start up competing businesses, as was the case with one workshop owner interviewed who lost 40% of his retail market share to ex-employees who began producing ship windows out of lower grade materials.

Marketing information is kept even more closely guarded. In addition to the tactics mentioned above, sometimes domestic market suppliers will come to the sentra and play the workshops off of each other, using their proximity and lack of specialization to engage them in competitive price-cutting.23 The owner of KPY, one of the District’s most successful metal workshops in both subcontracting and retail production, explained that lack of trust and mutual suspicion between metalworkers was the main constraint to metal works development and was the reason for the lack of growth in metal workers associations.24

**Sustainability**

Large enterprises are helping inti gain the capacity to manufacture component parts, but there has been little private sector interest in upgrading from specialized parts manufacture to manufacture and assemblage of finished products.

Both the retail market and subcontracting links are under pressure by the rise of China as a regional competitor in metal manufacturing. In the retail market, Tegal metal parts and finished goods face competition with cheaper Chinese imports. Subcontracting also faces competition from changing production chains. As more assembly is done in China, it becomes more efficient to produce components closer to the place of assembly. Tegal’s metal workshops stand to be disproportionately affected by this as it becomes more cost–effective to produce remaining components in metal production centers in Jakarta, decreasing transportation costs.25

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21 For example coming up with new ways of mixing of scrap metal that yield a result that still passes quality control. Interview with small retail market workshop Pak Sartono on September 4, 2005 and Pak Urip in Focus Group Discussion on September 3, 2005.
22 Interview with Pak Amin Solahuddin, Owner of plasma workshop, September 1, 2005.
23 Interview with Pak Rojikin, Owner of small retail market workshop, September 6, 2005.
24 Interview with Pak Angwari, Owner of inti workshop, September 5, 2005
25 Komatsu used to subcontract metal casting orders for about 10 tons of product from Bandung and Ceper (Klaten). The order has been reduced to 300 Kg and moved to Jakarta. Interview with Pak Franz, Komatsu Representative, October 28, 2005
Is the local government motivated to improve the skills of metalworking firms in Tegal?

While the district government has demonstrated a high level of awareness of the importance of enhanced knowledge and skills to improve the competitiveness of local metalworking shops, it has not yet been very successful at systemically improving the skills of local firms. It has attempted to both facilitate direct trainings as well as build up supporting institutions that can assist firms, and lower information costs among firms. These efforts, while significant and well intentioned, have been handicapped by poor targeting, lack of sufficient funds, a small number of skilled staff dedicated to the effort, and weak feedback mechanisms between government and metalworking shops.

The district government’s strategy has three prongs, the first being the provision of direct training to metalworking shops. The District Industrial Affairs Sub-Agency normally facilitated trainings that were delivered by the central government’s BBPT, with approximately eight trainings delivered annually to 20-30 people per training class.

Second, as part of its policy of strategic focus of concentrating on specific sub-sectors, the government tried to lower information costs and promote marketing linkages among the metalworking clusters that produce components for ships and autos. It has created meeting venues for workshops in each sentra to gather and share information.

Third, the district government promoted the development of support institutions to assist metalworking shops with improved skills and technologies, and provide indirect links to private subcontractors. These included the UPTD lab, Politeknik Purbaya, and the Center for Technological Services and Innovations (PPIT).

The provision and facilitation of training

The district government is keenly aware of the positive links between subcontracting and knowledge transfer. Although private trainings were described as more effective, the government’s role in providing missing knowledge to workshops—both those targeted by and those left out of the private sector’s involvement—should not be undervalued. Private sector training mechanisms are determined by market incentives with content circumscribed by the needs of the large enterprise client. Tegal’s smaller metal workshops receive no direct training benefit from large enterprises as knowledge providers.

The government is the only source of managerial training for plasma and retail market workshops as well as many inti that receive only limited management training from large enterprises clients. Since 2001, the majority of government trainings have focused on technical subjects or technical quality management processes. For some smaller workshops without direct links to large enterprises, local government-
facilitated technical trainings remain the only source of technical information outside the past experience of the workshop owner.

Training specifically for the metalworking sector began in 2004 but swiftly became the focus of government training with all but two trainings in 2004 and 2005 dedicated to the metalworking sector. Of these, two were management trainings. However the government’s budget for this activity is only IDR 110,000,000 or approximately US$ 10,000.

According to respondents who participated in government trainings, these activities were poorly targeted, often exceeding their skills or machinery available or conversely focusing on skills they had already mastered. One respondent working with the government training effort estimated that, out of five government trainings, two provide material that is not applicable to the attendees. Training paid for and provided by Jakarta-based organizations, both government and non-government, was particularly problematic as production technology from these organizations was superior to that used in Tegal. Trainings had little focus on follow through or application with some of the metal workers observing, “government trainings are necessitated by government spending, they don’t care what happens afterward—as soon as the training is done, the book is closed!”

Metalworkers often had rather high expectations of the government trainings, and some firms thought that the trainings would result in government-facilitated work orders. The team did come across one example of government follow up. The Politeknik Purbaya holds follow-up night, where past trainers hold discussion and consultation forums. In 2004, there were about four or five of these sessions attended by those who have followed the training, and metal workshops from around the area.

Local Government Reaches Out

Tegal District’s government has benefited from an important innovation. It has forged close ties with the Central Government’s Agency for the Assessment and Application of Technology (BPPT) and has reached out for policy input from local stakeholders and civil society organizations through the Regional Competitiveness Board (DPDS), a forum that tries to advance and empower small businesses and home industries.

Casual Friday afternoon discussions bring up new issues and focus on items for the policy agenda. This is then passed on to the respective government agency, the Regional Development Planning Board (Bappeda) and sometimes BPPT for further consideration and input. Institutionally, beginning in 2004-2005 a partnership has been set up with the regional government on providing input for regional regulations. Input is given based on supporting data available from government sources but also on newly gathered primary data. Specifically in response to Law No. 25 /2004 on National Development Planning System, where every regional government must prepare a long term, medium term and yearly working development strategy, the DPDS will be setting up a forum to give input on what those working development plans should prioritize.

27 Interview with Pak Syaekhudin, DPDS member and lecturer at Politeknik Purbaya, September 6, 2005
28 Statement from Pak Masrukhi in a Focus Group Discussion, September 3, 2005.
29 Interview with Pak Syaekhudin, DPDS member and lecturer at Politeknik Purbaya, September 6, 2005.
**Efforts to lower information costs and support marketing linkages**

Another important factor underlying the District government’s difficulties in matching training to workshops is in its approach to disseminating knowledge to the cluster. The local government relies on a small group of “motivated” workshops, less than 100 of the estimated 2,811 metal workshops, to mobilize audiences for trainings and other government programs. Applied in a cluster characterized by limited mutual cooperation and communication, this approach tends to favor workshops and personal networks of a small number of owners and increases distrust between workshops.

The District Industrial Affairs Sub-Agency has chosen to focus much of its attention and resources on the metalworking industry out of its wider portfolio of 28 different industries. Then, within the industry, it has singled out two promising groups of metalworking enterprises. Since 2000, the government-led knowledge diffusion initiative has focused on creating or “intensively guiding” Tegal’s auto and ship component industries towards becoming a functioning production cluster. The government selected these two from the seven metal working sentra to receive sustained government support. This shift comes in response to perceived shortcomings of its previous policy, which dispersed the District’s limited resources across the entire metalworking industry to little success. Even with this more focused effort, the office is hard pressed to create the necessary measures and environment to transform the sentra into functional production clusters.

One of the major pillars of local government’s knowledge diffusion strategy is setting up supporting institutions that build the cluster’s capacity through increasing its human and technical resources. Support institutions help to attract and maintain subcontracting linkages between large enterprises and local workshops overcoming the problem of the “vicious circle, whereby firms are unable to specialize in the absence of subcontracting, and subcontracting is not developed due to lack of specialization.”

Support institutions that were either directly set up by the District Government or established in close cooperation include the UPTD lab, Politeknik Purbaya and the Centre for Technological Services and Innovations (PPIT).

Inti, plasma and retail market workshops also look to the government to provide marketing facilitation. The government sponsors local workshop participation in trade shows in Tegal, Surabaya and Jakarta. It serves as a subcontracting matchmaker between local workshops, matching plasma seeking new orders with inti or inti that need additional subcontracting plasma, and uses its links with large enterprises to match them with potential subcontractors. Many smaller workshops stated a strong aversion to doing their own marketing, preferring buyers or intermediaries to come directly to them or to be lead to them by the government.

**The development of supporting institutions**

The local government office leading the effort to develop Tegal District’s metal workshops, the Industrial Affairs Sub-Agency, under the Agency of Industry, Trade, Cooperatives and Investment, has a staff of 10 tasked with promoting the development of 28 different local industries. Given these

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Practical Methods for Lowering Information Costs

The local government has set up groups where metalworkers can share information. One group visited by researchers had a central meeting venue, but it appeared that information flows and resource distribution depended mostly upon personal relationships, and were not systematically and transparently disbursed by the group’s leaders.

The local government also tries to decrease information costs by keeping a limited database of workshops and their capabilities. Large enterprise can search for potential subcontractors and inti can search for potential plasma. However, to be made more effective, this effort needs to be expanded and the results made accessible and transparent.

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30 ATPS Special Paper Series No. 20 citing Rosenberg (1976).
limitations, the local government’s knowledge provision strategy has been to leverage its impact through encouraging and facilitating the involvement of other institutions in local development to provide technical trainings on metalworking techniques as well as managerial training on subjects such as quality control and financial management.

Tegal District’s local government has currently partnered with outside institutions including strong partnerships with the Central Government’s Indonesian Agency for the Assessment and Application of Technology (BPPT) and with an NGO, Yayasan Dana Bakti Astra or YDBA. Although this strategy succeeds in bringing new knowledge to the cluster, as mentioned above, the offerings are often not suited to the needs of workshops attending trainings.

In 1997, the District Government opened the UPTD lab to enhance subcontracting workshops’ ability to produce with precision. The first government funded lab opened in 1982. There the metal working cluster was able to access the machines necessary to fill their orders. The lab was not able to keep up with technical advances and soon several of the workshops internalized more advanced machinery.

Businesses that use the UPTD lab are those that are able to pay the high usage fees, usually more developed workshops that put quality above pricing. When subcontractors raise prices because of increased technical costs or higher quality metal compositions, they will provide evidence (lab print out, etc.) that they have done proper tests to justify their expensive technology and material use in pursuing quality output. With its precise instruments and skilled technicians, the lab can develop technical drawings, a prototype and production plans from conceptual drawings, or—given technical drawings—can develop precise metal casting molds and production plans. These are subcontracting pre-production challenges outside the technical capabilities of many small and medium sized workshops. All workshops make use of the lab’s material testing services, which require equipment yet to be acquired by cluster workshops. The Lab however faces a serious challenge in that operators are all university graduates, but the government has not been able to offer sufficient incentives to keep them in the District. They were paid IDR 400,000/month, which is below the District minimum wage. Out of the initial fourteen, only nine remain, the rest have taken up jobs with large companies in Jakarta.

Politeknik Purbaya was certified and launched in September of 2002. The BPPT was heavily involved in the establishment of the polytechnic, helping with licensing by personally approaching the Director General for Higher Learning Institutions and convincing them to receive an MOU of collaborative efforts between district stakeholders. The Regional Competitiveness Board (DPDS), with membership from three key offices in local budgetary process, Industrial Affairs sub-agency, local parliament and local regional planning board, played a critical role in coordinating government support and ensuring the polytechnic project had necessary funding.

The polytechnic relies on government-donated facilities and machineries for a training lab, and metal workshops volunteering their workers to give guest lectures. The institution was described as “perhaps a bit chaotic given that its founders had no background in managing a higher learning institution but chaotic does not always mean that it’s non-functioning, or broken.” Teaching activities started immediately with one faculty (machine techniques) and six professors. In 2003 a second faculty was added (accounting) and a third faculty is currently being set up (information technology). The polytechnic had five students in 2002 but has seen steady growth with 24 students in 2004. The local government uses Politeknik Purbaya to host and support government-led or government-arranged trainings, though apart from increasing class sizes, it is still too early to know if this approach will yield positive results.

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31 YDBA is connected with Astra and was established in 1980 with the objectives of working with government and other actors to empower micro enterprises and cooperatives.

32 Interview with Pak Dasuki, Head of Industrial Affairs Sub-Agency, September 14, 2005

33 Interview with Pak Syaekhudin, DPDS member and lecturer at Politeknik Purbaya, September 6, 2005
In addition, the central government’s BPPT is trying to address the challenges of workshop upgrading and cluster development. The local government has engaged workshops in the manufacture of the RUSNAS\textsuperscript{34} engine, a 12-year BPPT sponsored project. Initial orders were secured for twenty 500cc engines to be filled in 2005 with retailing beginning in 2006. Thirteen workshops were selected to take part in production.

\textsuperscript{34} \textit{Riset Unggulan Strategis Nasional} or National Research on Strategic Specialties
BIBLIOGRAPHY


