

# The Social Tie That Binds: Academia-Industry Collaboration in ATMI Polytechnic Cikarang, Indonesia

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**Abstract**—The paper's key objective is to explore the social tie enabling the knowledge flow in the academia-industry collaboration. The inquiry is based on an ethnographic work in ATMI Polytechnic Cikarang. It pursues its analysis through case studies. The main argument in this paper is that alumnaeship is the social tie fostering the academia-industry linkage. This social tie invites one to reconceptualise the notion of physical proximity. Such reconceptualisation is tenable, as this research shows: first, the pertinence of geographic reference point being made to ATMI Polytechnic Solo for collaborations to take place, and second, the thick linkage of alumnaeship enabling the flow of tacit knowledge. The study contributes to the inquiry of academia-industry collaboration from an organisational sociology standpoint.

**Index Terms**—Vocational education, industry-academia collaboration, tacit knowledge

## I. INTRODUCTION

*I have offered the Dean office of The Faculty (of Engineering in University of Diponegoro/Undi in Semarang, Indonesia) access in our shop floor in this company, to enable them to explore the process of production. But they do not want to. They are not ready. Polytechnics like ATMI are much more ready than Undip (Informal discussion, Cikarang, 19.11.2010)*

The interviewee cited in the beginning of this paper aired his concern that a polytechnic like ATMI is more ready than university to collaborate with companies. Collaboration, in this case, is offered to explore the problem-solving process and the production process in the supplier company. Are polytechnics organisationally more ready to interact with companies for knowledge flow and knowledge exchange? Existing studies have demonstrated the contemporary challenges of universities. Starting from the role of universities in the regional context [1], the hierarchical administrative structure [2], the corporatisation or commodification of universities [2], [3], up to how the role and status of university is connected to the paradox of values of science in society [4]. Polytechnic, which is part of the science system at the regional level, is largely ignored. One can cite, for example, the study carried out by Petruzzelli [5]. He analysed the patents registered at EPO and the R&D

projects of the Polytechnic University of Turin. The result showed that the majority of actors exchanging knowledge are partners of regional and European projects [5]. These involve universities for European projects and public organisations for regional projects [5]. By studying organisation as a site of study, one would be able to infer the context of the knowledge production to enable public investment of science [4]. Moreover, one could also infer the social tie enabling the collaboration between academia-industry. Academia in this paper shall be used to specifically refer to the polytechnic. The analysis that shall be presented in this paper will focus on the second aim, namely the collaboration between academia-industry. It will specifically observe the social tie (for a discussion of social tie and social relation see [6]) enabling collaboration between academia-academia and academia-industry in the ATMI Polytechnic Cikarang, Indonesia. The disciplinary standpoint of analysis is that of organisational sociology.

The next question would be, why ATMI Polytechnic Cikarang? The rationale is first due to location. The polytechnic was established with the explicit rationale of being in close geographical proximity to companies in the Jababeka Industrial Cluster [7]. The Jababeka Industrial Cluster is the largest industrial cluster in Indonesia, hosting over 1,000 companies [8], [9]. Second, the polytechnic is a unique case study in that it functions on the basis of a production-based education system. This means essentially that the majority of the cost of education is subsidised by production. Production consists mainly of parts manufacturing [10]. In light of liberalisation of the higher education sector in Indonesia and the lack of funding capacity of the decentralised local government at the district level [9], other alternative models of financing higher education, such as the production-based education system, are worth exploring.

The main research question dealt with in this paper is, what propels the collaboration of academia-industry, organisationally, and in the context of vocational education? The analysis is based on intensive ethnographic fieldwork that took place for three months, from the middle of November 2010 to the middle of February 2011. It is complemented further by descriptive quantitative analysis. There were 17 respondents interviewed from the polytechnic. In addition, there were eight respondents from automotive supplier companies interviewed. Participant observation was carried out during the fieldwork in the everyday routines and meetings. Case study analysis [11] is also presented in this paper to probe the existing collaboration further.

Knowledge is often termed one of the factors of production [12], [13]. A critical inquiry of contextual knowledge

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production requires one to observe the daily activities of knowledge production and look at what constitutes know-how prior to conceptualising it as tacit or explicit knowledge. Understanding this is exactly the strength of organisational sociology. It allows one to delve into the epistemic culture [14] and the actual working of the organisation in the academia-industry collaboration. The term knowledge in this paper is taken as tacit knowledge of the knowledge workers in the polytechnic. The knowledge workers are limited to lecturers and instructors working in the polytechnic. This tacit knowledge resembles the work process knowledge, which is essential in vocational education [15], [16]. This tacit knowledge also includes the know-how on techniques of processing and techniques of assembling. It is neither completely rational nor emotionally detached. In fact, there has been a repeated emphasis on the usage of feeling [17] in the usage of scale and the reading of drawings. Tacit knowledge also incorporates a set of organisational routines pertaining to human capital, such as training and internships organised by the polytechnic. By focusing on day to day activities in the university, in company offices and on the shop floor, the paper intends to make an empirical contribution to the discussion about knowledge for development [18], [19] through the lens of academia-industry collaboration.

It is argued that the collaboration of academia-industry is enabled due to alma mater linkage. This is the social tie that binds the academia-industry collaboration together. There are two sides to this argument. On the one hand, collaboration with industry is easy if the majority of the company's workers are ATMI Polytechnic graduates (either in Cikarang or in Solo). On the other hand, once this alma mater is non-existent, it is quite difficult for collaboration to take place. This social tie of alumnae, I contend, is an imperative element in the academia-industry collaboration in Indonesia. Furthermore, this alma mater network reconceptualises the notion of space in that one must think beyond the concept of physical proximity.

The paper is organised as follows: the second part discusses theoretically the existing discussion in the literature pertaining to knowledge flow between academia-industry in Indonesia. The third part provides a brief historical overview of the polytechnic. The fourth part looks at the tie between ATMI Polytechnic Cikarang and ATMI Polytechnic Solo. The fifth part observes the collaboration between ATMI Polytechnic Cikarang with IMV Company, which was curtailed due to the fact that the geographical reference point being made was with Solo instead of Cikarang. The ATMI Polytechnic Cikarang collaboration with TC Company, which is enabled due to the alma mater factor, is elaborated on in the sixth part.

## II. KNOWLEDGE FLOW BETWEEN ACADEMIA-INDUSTRY IN INDONESIA

A prominent approach in observing academia-industry collaboration in Indonesia is the 'triple helix' approach. It denotes a model or metaphor for innovation to observe the knowledge sharing/exchange processes and governance within a cluster. It is grounded in the separate academic,

industrial and governmental spheres, and the knowledge flows among them. 'Helices' define the boundaries of academia, industry and government which represent specialisation and codification in function systems which evolve from and within civil society' [20]. In triple helix I there is a specific historical condition whereby the nation-state encompasses academia and industry, and thus controls the relations between them. The division of the institutional spheres between the three organisations includes the delineation of relations marked by the *laissez-faire* triple helix II. The triple helix III exhibits trilateral networks and hybrid organisations across the three organisations. There is an inception of knowledge infrastructure through overlap between the institutional areas, with each playing the role of the other with the creation of hybrid organisations at the tip of the interface [19]-[21].

The argument of the 'triple helix' is that academia can play an improved role in innovation within an increasingly knowledge-based society [23], [24]. The authors of 'triple helix' theory focus on universities. The triple helix approach focuses on the network overlay of communications and expectations that restructure the institutional order between universities, industries and government agencies [22].

There has been a consistent emphasis on university in the previous work on academia-industry collaboration in Indonesia. In the Bandung Knowledge Innovation Zone study of academia-industry cooperation [25], the emphasis would be on knowledge management. Yuliar and Syamwil [26] looked at Bandung Technology Institute and Satya Wacana Christian University, focusing on how the members of the faculty responded to the policy alteration of a more 'economically driven steering mechanism' of autonomous universities. The examination provides hints as to how universities internally respond to the liberalisation, in this case how they respond to the market system. In addition, Beerkens' analysis [27] showed that, among other factors, low knowledge demands from the private sector affect the lack of opportunities for industry and academia cooperation in Indonesia.

Recent work on 'triple helix' and science and technology assessment in Indonesia did observe vocational education. An assessment of the Solo Techno Park in Indonesia showed that the ATMI Polytechnic in Solo initiated the Surakarta Competency Technology Center (SCTC), which satisfies the human resource training requirements of industries [26]. It started with the SCTC in 2003, and then expanded to the concept of a techno park [70]. The techno park was initiated by the ATMI Polytechnic Solo in cooperation with the City Government, Central Government and business sectors [7]. A different study is the *Fraunhofer Gesellschaft* and RISTEK study from 2002. This study provides a macro overview of the Indonesian Academic and Training System and includes a brief assessment of the vocational education [29].

What is missing in this conception of 'triple helix' theorem is the conception of social proximity. Indeed, this has been discussed by Boschma [28]. He coined various conceptions of proximity: cognitive proximity, organisational proximity, social proximity, institutional proximity and geographical proximity [28]. In this paper the concept used is derived from the daily narratives of the organisational routines (of the

polytechnic) and the respondents. Specifically, the terms used are geographic reference point and physical proximity. The next part will discuss the historical overview of the ATMI Polytechnic Cikarang.

### III. A BRIEF HISTORICAL OVERVIEW OF THE ATMI POLYTECHNIC CIKARANG

ATMI Polytechnic Cikarang was established in 2001 following the relatively successful operation of ATMI Polytechnic Solo. Both of them are managed by the Karya Bakti Foundation [7]. The Karya Bakti Foundation is a Catholic organisation with a membership of the Indonesian Jesuits [7]. The ATMI Polytechnic in Solo was initiated in advance in 1963 [31], with the help of the Franz Xaver Foundation in Zurich, and cooperation of the Switzerland Ambassador. The Swiss Government and the ATMI Polytechnic in Solo managed to cover some of its production cost [7], [31].

There are two directorates playing a key role in the knowledge production and flow; they are namely the Directorate for Production and Industrial Cooperation (or production directorate) and the Directorate of Teaching (or academic directorate). The ATMI Polytechnic in Cikarang is formally a separate entity from the ATMI Polytechnic in Solo. It is located in Jababeka Industrial Park, one of the largest industrial clusters in Indonesia to support manufacturing training and academic for the workers in Jakarta and Bekasi [31].

Parts manufacturing has been and continues to be an inseparable activity of both polytechnics. Parts in here refers to mould, blow mould, die casting, dies, special purpose machines, and jig fixtures, as well as component spare parts that would be, but not restricted to, shaft, gear, flange, and parts composed of ferro, as well as non-ferro-based materials (Email communication with key informant, 03.07.2011). In ATMI polytechnic Cikarang itself, there are three segments involved in the parts manufacturing in the polytechnic. First, the students of the polytechnic, notably the second year students, are fully involved in production (Observation, Cikarang, 07.02.2011). Second, the instructors of the polytechnic are involved in the teaching practice of the students and at the same time in the manufacturing of parts. The third segment is the employees in the Production Directorate, in particular at the Independent Business Unit, (*Unit Bisnis Mandiri/UBM*), Engineering (Design), and Production Planning Inventory Control (PPIC).

Thus, the ATMI Polytechnic Cikarang was established after the ATMI Polytechnic Solo. They are both managed by the Karya Bakti Foundation. Akin to the polytechnic in Solo, the ATMI Polytechnic in Cikarang also produces parts.

### IV. ATMI POLYTECHNIC SOLO AS THE GEOGRAPHIC REFERENCE POINT

This article contends that ATMI Polytechnic Solo, located in Central Java, functions as a geographic reference point for external collaboration in the ATMI Polytechnic Cikarang. This creates two implications: first of all, the social tie between ATMI Polytechnic Cikarang and Solo cannot be

severed; it remains interwoven into the day-to-day activities of ATMI Polytechnic Cikarang. Second, this dense social tie of alma mater may obstruct the academia-industry collaboration, as shown in the case of IMV-ATMI Polytechnic Cikarang.

#### A. *The Tie That Cannot Be Severed: ATMI Polytechnic Solo-ATMI Polytechnic Cikarang*

It is not only the historical connection; the social relationship between ATMI Polytechnic Cikarang and ATMI Polytechnic Solo is also thick. This social tie is fostered by the alma mater network.

The polytechnic in Solo is often referred to as *saudara tua* (elderly brother), or *simbok* (the mother). The meaning accorded to these terms indicates that the instructors and lectures are historically linked to another site or organisation that gave birth to the polytechnic in Cikarang. Several partnerships between multinational companies and the polytechnic in Cikarang were initiated and/or managed by the Karya Bakti Foundation and polytechnic in Solo. The polytechnic in Solo is also influential in terms of the stock of knowledge in teaching modules (*diklat perkuliahan*). Out of 56 teaching modules used, 24 of them are produced by the polytechnic in Solo (Observation, Cikarang, 06.01.2011).

Interestingly, it is as if there is no difference between the two organisations. Most of the lecturers and instructors do not always identify themselves as alumna/alumnae of polytechnic in Solo or Cikarang. The column for the questionnaire was left with an open-ended answer, allowing respondents to fill in their alumnae participation. The majority of lecturers and instructors are alumnae of the polytechnic, with a percentage of 63,6%. At second place with 13,6% is alumnae from Sanata Dharma University. The third is alumnae of Gadjah Mada University (*Kagama* or *Keluarga Alumni Universitas Gadjah Mada*) with a percentage of 9,1%. The remaining 4,5% is alumnae from *Mertoyudan Seminari* in Yogyakarta, University of Sebelas Maret in Solo, and Mercuri Buana University in Jakarta.

Alumna or alumnae of the polytechnic either in Cikarang or Solo are trusted in the polytechnic for implementing changes in the learning process (Observation, FGD notes 19.02.2011). Exemplary evidence would be the comparative study initiated by the academic directorate to learn more about codifying learning and know-how in the teaching syllabus. They, namely the instructors and lecturers, decided to go to polytechnic in Solo. It is not the Manufacturing Polytechnic in Bandung, which is closer to the polytechnic in Cikarang; it has to be the polytechnic in Solo. This is described in the following dialogue:

*Researcher: Why do you have to go to ATMI Solo to reflect with have you have here for teaching syllabus and main guidelines for teaching?*

*Respondent: Well, because we are not yet experienced like them in Polytechnic Solo (Informal discussion, February 2011).*

After they returned from Solo, I asked what they got the most out of the trip in regards to the teaching syllabus. A respondent who went to Solo answered in a lukewarm manner:

*The problem in the polytechnic in Solo is similar with us in here. There is no teaching syllabus and main guidelines for teaching. No teaching syllabus for machines, only standard operating procedure. It is difficult to codify the learning process for students, to move from theory to practice or practice to theory (Informal discussion, February 2011).*

Thus, the comparative studies do not fulfil their intended tasks. The yardstick that they take up is with the polytechnic in Solo, which has not successfully dealt with the issue yet.

To sum up, the tie of alumnaeship plays a crucial role in terms of developing the human capital stock and knowledge stock. The everyday interaction is weaved by the social tie of the two organisations. The tie also brings trust and is shaped by historical attachment. This makes it difficult for the social tie to be severed.

#### *B. It Has to Be With Solo: IMV – ATMI Polytechnic Cikarang Collaboration*

The collaboration with IMV was not successful due to a different conception of proximity. IMV itself is a subsidiary company of IC Berhad – located in Malaysia. IMV is located in the Jababeka Industrial Cluster. It is in close proximity to the ATMI Polytechnic in Cikarang. The products that IMV manufactures in Indonesia include door-sashes for cars, sash-related components, and mouldings. One of the suppliers is IGI ATMI (Interview, Cikarang, 09.12.2010). IGI ATMI is a company managed by the ATMI Polytechnic in Cikarang (Observation, Cikarang, February 2011). IMV approached IGI ATMI, asking about the possibility of IGI ATMI manufacturing dies for the Toyota Innova car in Indonesia in 2012. The respondent explained how the dies needed for the order were huge in number and in size, and there was a problem of overcapacity within the production level in ATMI Polytechnic (Interview, Cikarang, 13.01.2011). I asked further in regards to the role of this 'parent', is this *saudara tua* (elderly), and the reply was straightforward:

*Yes it is (saudara tua), they (Solo) would give a price proposal, we then submitted it to IMV, but afterwards there was a miscommunication. I soon asked and it seems that the agreement will start in 2012, and yet to manufacture this year. So there was a delay for one year (Interview, Cikarang, 13.01.2011).*

In a different tone, another respondent affirmed that the order had to be shared with Solo.

*For the dies, I understand there are six items. For each item six dies are required. We then make a quotation. Of course we cannot make it in our shop floor we have insufficient facility, I offered to IGI ATMI located in Solo, we cannot do it ourselves here. Total of 30 dies in four months, can you imagine how many we have to produce each month? Thus we have to share the order to polytechnic and to Solo. It is much more ethical to have one door policy (penawaran satu pintu) (Interview, Cikarang, 05.01.2011).*

IMV voiced its concerns about how it tried to initiate cooperation with the polytechnic to develop a particular model of dies, yet the cooperation failed to materialise. A key personnel in the Engineering Department explained why the

cooperation withered before it started:

*We once have had a cooperation to manufacture a machine with the polytechnic (ATMI Cikarang), we gave them a chance to build a machine altogether with us, but the problem is, from the angle of cost IC is held fully responsible. What we intend is fifty-fifty percentage, we gave them the materials, whilst they supported the machining. But in this case this failed to materialise, because they wish everything to be covered by us. We mind about this. They make it difficult for themselves, you see. You know we placed orders to the polytechnic in Cikarang because they are located within reach from us. Yet the problem is what we want is a partnership, they on the other hand wish that the machining part to be paid fully by us. (Interview, Cikarang, 22.12.2010).*

Another interviewee from IMV complained about the different geographic reference point that IMV and the polytechnic have (Informal discussion, Cikarang, 22.12.2010). I later brought up this issue during the interviews with respondents from IGI ATMI. Explaining the situation and respondents, and as I was involved in the daily activities of the Polytechnic, the response was varied. First, I asked why the quote given was expensive and expressed how IMV wondered why do you have to go all the way to Solo for the purpose of dies making. The respondent confirmed this and spoke about how this affected the price and the lengthy production process (Interview, Cikarang, 13.01.2011).

This dissimilar geographic reference point is due to an internal organisational obligation within the ATMI Polytechnic in Cikarang. This obligation outlines that the job order must be shared with the polytechnic in Solo (or IGI ATMI Solo). Second, the conception of proximity differs. IMV prefers geographical proximity, whilst the ATMI Polytechnics in Cikarang and in Solo are both welded in social tie (of alumnaeship). These different conceptions stalled the academia-industry collaboration.

#### V. ALUMNAESHIP AND THE FLOW OF TACIT KNOWLEDGE

The second rubric of argument pertaining to social tie is that alma mater facilitates the flow of tacit knowledge. In cases where tacit knowledge is internalised, the role of gatekeeper supporting the learning process into the teaching activities is vital.

##### *A. Alma Mater and Shared Vision: Collaboration of TC Company –ATMI Polytechnic Cikarang*

This subsection will present an analysis of how alma mater and shared vision or ideals of the top managerial level nurtures the collaboration. TC Company was established in 1994. It specialises in the production of metal stamping, plastic injection moulding, jigs, and fixtures for automotive and motorcycle components (Observation, Cikarang, 28.01.2011). It is one of the local Indonesian supplier companies receiving the supplier development training of Jishuken (group study) programme under the Operations Management Consulting Division (OMCD) Toyota Indonesia. TC is the customer with the highest rate of job orders for parts manufacturing in the Polytechnic (Observation during meeting, Cikarang 27.01.2011). Indeed,

physical proximity is one of the main reasons for this job order (Interview, Cikarang, 13.01.2011). This was stressed by a respondent in the ATMI Polytechnic Cikarang:

*At the moment, TC remains our foremost customer with the highest job order. This is because we are closely located with TC (Interview, Cikarang, 13.01.2011).*

It is not only because of close physical proximity, but it is also due to the alma mater tie. Both in fact strengthen each other. One of the managers working in TC is an alumnae of the polytechnic (Interview, Cikarang, 20.11.2010). This alumnae network accords trust to the graduates and the knowledge workers of the polytechnic in Cikarang, especially in the field of machinery and automotive-related fields (Interview, Cikarang, 20.11.2010). I asked one of the top management leaders to why do TC interact more intensively with the polytechnic rather than with other higher education organisations located quite close such as President University. He replied:

*It is simple actually the Polytechnic is a school that we considered in here as well from the perspective of automotive and machinery, we know very well indeed that the polytechnic graduates are qualified, the name is of prestige and most of my employees are alumnae of the Polytechnic (Interview, Cikarang, 06.09.2010).*

Whilst explaining this, the respondent was providing gestures of friendliness by nodding repeatedly for the cooperation between the polytechnic and TC (Observation, Cikarang, 06.09.2010). A different response was given when he explained the cooperation with President University, which was signalled with a shrug of the shoulder (Observation, Cikarang, 06.09.2010).

There are also the shared ideals among the top leadership in polytechnic, as well as TC, to enable access to vocational education for Indonesians in the West Java area. This leads both organisations to plan a *Sekolah Menengah Kejuruan*, or Vocational School, in the Cikarang area (Field notes, Cikarang, 20.11.2011). The approval of top management from both sides, as expressed through various occasions of informal talks, indicates the confidence expressed in this cooperation, and legitimises the collaboration of the polytechnic and TC (Observation, Cikarang, 20.11.2011, 06.09.10).

The polytechnic attains the know-how through the job order from TC. In the dies trial, the TC engineers visited IGI ATMI to assist in problem solving. The respondent clearly explains how he could pose questions, day-to-day problem solving to the engineers, and how TC is open for sharing knowledge. A respondent described this in detail:

*IMV is open to us, and of course also TC. Do you know Pak (mentioning name) in TC told me that if you have problems such as unavailability of machines, or you cannot manufacture the parts, or the dies is broken, to come to TC production plant. He added that there would be an expert from the engineering who will help you out, you could also learn from him. That is not only it, we also learn on how to make standard for operating procedures for the machines from them (Interview, Cikarang, 13.01.2011).*

The meetings between the two organisations would be facilitated with the visualisation of problems or parts (which will be produced) (Interview, Cikarang, 13.01.2011). The engineering or Quality Control visit from TC to IGI ATMI became a means for knowledge flow. This was described by a respondent:

*Usually tool is brought in here with the engineers, then we would do a trial of the product together, overcome problems together, all in all to attain that product that we both can say okay, then again what is okay between here and there (TC), we need to have a meeting. So learning takes place by inviting engineers from the customer here or we would go there to ask questions, we did the trial and gave the samples to TC and asked to them whether this is correct. Result from the QC is the dimension measurement and performance, if the parts received a green light from TC, we shall proceed to the manufacturing (Interview, Cikarang, 05.01.2011).*

Thus it is evident that meetings take place face-to-face. In addition, there is visualisation of problems or parts to be manufactured. Despite the fact that there are minutes of meetings documenting the problem-solving activities, this knowledge is kept on the tacit level (Observation, Cikarang, 13.01.2011). They coined this tacit term as *disimpan di kepala*, or being kept in the head. This tacit dimension of knowledge sticks to the individuals in polytechnic and in IGI ATMI. It is restricted to those who were involved in the learning and production process with engineers and QC from TC (Field notes, Cikarang, 03.12, 2010).

To sum up, the following factors drive the interaction of knowledge flow: geographical proximity, alumnaeship, and shared ideals at the top management level of both organisations. The flow of tacit knowledge is facilitated though face-to-face meetings. Problems (with parts and production process) are often visualised on the shop floor.

#### *B. Restricted Learning: The Collaboration between NTC - ATMI Polytechnic Cikarang*

As opposed to TC, there are not a lot of graduates of the polytechnic working in NTC. NTC is located in MM2100, Cibitung, Bekasi. This subsection will show how knowledge is attained and how it is constricted only within the production process. The core businesses of NTC are automotive components, namely press parts, welding parts and die-making (Observation and Interview, Cikarang, 21.11.2010). Their main products include but are not restricted to support sub assy clutch pedal, arm sub assy, and upper suspension. The polytechnic manufactured some of the parts, such as die-making, for the process of forming. In other words, it produces parts not directly as a spare part for automotive parts, but instead produces the tool. The tool is dies for the forming of the parts for NTC.

Drawing is the knowledge output of the staff members in the polytechnic. Producing parts requires an interpretation of the drawing. This way job orders from the customer can be materialised on the shop floor. Oftentimes it becomes necessary to have a discussion between instructors (and employers) and externally with customers. The discussion enables the instructors to comprehend the operationalisation of the design (drawing) and the quality control tied to the production process (Interview, Cikarang, 21.11.2010).

It is through the job order for the dies stamping that the know-how of the manufacturing process is attained. A respondent described how he learnt from the engineering division of NTC, especially the Japanese experts, for the stamping dies (Interview, Cikarang, 21.11.2010).

The form of knowledge that flows is tacit in character i.e. the new experience and the new organisational practices are stored in the personal memory. A respondent explained this further. He explained his learning experience of organisational routine from NTC:

*There are occasions whereby the historical events are not recorded in the polytechnic. Thus once the personnel/employee changes, for example if I left this polytechnic company, there will be another person filling in my spot to design die-stamping. I am sure he will not follow the existing design. On the other hand, I found and have learnt that NTC has this particular organisational practice in cases of parts manufacturing NTC would not accept changes for matters that have already been informed and told. This is the practice, including the typology of machinery, that NTC uses. NTC does not care if and whether there are mistakes owing to a reassignment of personnel internally and other problems (Interview, Cikarang, 21.11.2010).*

This process of tacit knowledge is exchanged through storytelling. It was asked if the tradition is oral, through storytelling elaborating experiences on stamping dies. The respondent gave a nod and then he told me:

*The engineer (from NTC) told me how die stamping is more to the cultural practices of NTC. Sometimes we have to follow divergent corporate culture in different companies. Sometimes I design ideally, but generally this can change (Interview, Cikarang, 21.11.2010).*

The tacit knowledge does flow to the engineering division of the polytechnic. Internally there would be projects evaluation within the engineering unit. 'Project' is a fluid term used to denote each job order from companies or from other external organisations. Each of these projects is led by different personnel, yet each of them is an expert in a varying field from mould to general machines. These project meetings are normally held internally.

However, this knowledge fails to flow to the academic directorate. It does not flow to the teaching process. There are no joint discussions with lecturers as to revising modules, nor a collective effort to rewrite the syllabus/general guidelines of teaching. There are personal requests from the lecturers who are teaching theory-related subjects. They have asked to provide guidance in planning of general machinery (Interview, Cikarang, 21.11.2010). Yet this request seems to wither before coming into an action for two key reasons: first, the time frame of students in the laboratory is relatively limited; consequently they learn the foremost essential subjects. Second, this request seems to be less of a priority due to the gatekeeper in the polytechnic. This gatekeeper holds a key administrative position, and is an influential key person in the polytechnic. He saw this request of the lecturers as having less priority (Interview, Cikarang, 21.11.2010).

The NTC-polytechnic case highlights how the flow of tacit knowledge is facilitated through job order, with the medium of storytelling between knowledge workers. Nevertheless, within the polytechnic itself knowledge flows only within the

production directorate, not to the academic directorate due to lack of time resources and the influential role of a gatekeeper. This causes knowledge flow to be restricted. It is restricted in terms of having it to flow to the knowledge workers.

## VI. CONCLUSION

The article starts with a remark made by the head engineer of a company. He stated that polytechnics such as ATMI are much more prepared to interact with industry. The analysis presented is based on intensive ethnographic research of three months, starting in the middle of November 2010 and lasting until to the middle of February 2011. Qualitative data is complemented further by descriptive statistics. The question dealt with in this paper is, what enables the collaboration between academia-industry in the context of vocational education? Knowledge is taken up as tacit knowledge of knowledge workers in the polytechnic. The key argument in this paper is that collaboration between academia-industry is fostered by alma mater linkage. To corroborate this argument, part two provides a basis of discussion. Studies of academia-industry collaboration are usually carried out from the lens of 'triple helix'. The approach prescribes that academia can play a significant role in innovation. Numerous studies in the past have given more emphasis to universities than vocational higher education organisations such as polytechnic. There are exceptions to this, of course. Take, for example, the study of Solo Techno Park, which observes the role of ATMI Polytechnic Solo in initiating the techno park. However, these studies do not take into account the role of social tie in enabling the academia-industry collaboration.

Part three outlines the historical review of polytechnic. The ATMI Polytechnic Cikarang was established in 2001. It, along with the ATMI Polytechnic Solo, was managed under the Karya Bakti Foundation. There are two directorates holding key roles in the knowledge flow and knowledge sharing processes, the academic directorate and the production directorate. The ATMI Polytechnic Cikarang itself is located in Jababeka Industrial Cluster – the largest industrial cluster in Indonesia. Parts manufacturing administered through job order requests is a key tenet in the daily operations of both polytechnics.

Part four corroborates the argument of social tie. It contends that the ATMI Polytechnic Solo serves as a geographic reference point for external collaboration to take place in ATMI Polytechnic Cikarang. The alumnaeship tie is crucial for human capital and knowledge stock. The everyday interaction, trust and historical attachment to ATMI Polytechnic Solo cement the basis for this thick linkage. Indeed, such thick linkage brings a clear implication. As shown in the case of IMV, the collaboration stalled because of different views of proximity. The proposal for collaboration and the decision on price for cooperation are dictated by a different spatial reference point. One is based on social tie; the other one is based on physical proximity (and cost).

The fifth part further substantiates the main argument, namely that alumnaeship facilitates the flow of tacit knowledge. The case of TC company indicates the strategic role of alumnaeship and the shared ideals at the top managerial level for collaboration to take place with ATMI

Polytechnic. The tacit knowledge flow is facilitated via face-to-face communication. On the other hand, a different case is shown with the collaboration between NTC-ATMI Polytechnic. Unlike the prior case, there is no alumnae network. The tacit knowledge flows to those who are involved in the production process. Yet this tacit knowledge does not flow to the academic directorate due to the gatekeeper's role.

Summing up the inquiry of academia-industry collaboration unfolds the role of alumnae as the social tie. This is exemplified in the case of ATMI Polytechnic Cikarang.

This paper thus cements the foundation of future work in two respective areas: the first is in the study of large organizations. It brings into question whether tacit knowledge can be stored and measured purely by publication output and patents for vocational higher education. Second is in the study of social network and embeddedness. One could pose the question as to what extent alumnae as a social tie can enable (or disable) academia-industry collaboration, and how this affects the regional capacity of science (production). Moreover, can these social ties, which are enmeshed in historical precedents and repeated interactions that forge geographic reference points, be classified within the existing notions of geographical or cognitive proximity? Future research is needed to probe these areas.

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