Shifting Practices of Academia as an Entrepreneurial Organization in Indonesia

The Case of ATMI Polytechnic Cikarang

Farah Purwaningrum

Abstract The study examines how the polytechnic—as a knowledge producing organization in the Indonesian science system—produces and exchanges knowledge with other organizations in Indonesia. The study is situated in organizational sociology. The term “knowledge” in this chapter refers to tacit knowledge produced by knowledge-based workers in the polytechnic field. It discusses the production-based education method as well as entrepreneurial and academic organization. Empirically, it demonstrates the organizational change process heading towards the market and how collaboration between polytechnics and industry is achieved. By using reflexive ethnography, the chapter shows how practice at ATMI Polytechnic Cikarang Indonesia is changing, with the actual orientation of work shifting to an entrepreneurial organization.

Keywords Production-based education • Polytechnic • Indonesia • Knowledge sharing • Organizational change

This chapter addresses the question of how the internal structure of modern academia is affected by today’s knowledge-based economy and the increasing liberalization of the education sector. Governments in Southeast Asia, Indonesia and Malaysia in particular (Evers et al. 2010; Purwaningrum 2014) are increasingly paying more attention to research with links to industrial applications. Preliminary research in the knowledge hub of Brunei Darussalam indicates that despite the minimal linkage of industries with local universities, there is linkage between information communication technology (ICT) industries and polytechnic institutions. The study of industrial clusters in Penang, Malaysia, points out that adequately trained workforces, with appropriate vocational skills, are required to enhance the potential of the industrial sector (IPPTN 2010). However, the role of professionals in the vocational sector is often ignored (Grollmann and Rauner 2007). Polytechnics have been overlooked in most scientific work from academia, including work conducted in Indonesia, yet there is a growing consensus that polytechnics and universities are important institutions within the sphere of higher education (Tjakraatmadja et al. 2008; Yuliar and Syamwil 2008).

How is knowledge produced in the polytechnic field? Furthermore, how is this knowledge exchanged within the technical industry? These are the questions guiding the discussion in this chapter, which will focus on examining the process of organizational change. The study is situated in organizational sociology in looking at how a polytechnic—as a knowledge producing organization in the Indonesian science system—produces and exchanges knowledge with other organizations. I adopt a broad definition of “academia” in this chapter, which includes polytechnic institutions, universities, and R&D institutes.¹ To begin, academia is a part of the Indonesian science system; the organizational study presented in this analysis is focused on the case of ATMI Polytechnic Cikarang, Indonesia. The study is drawn from reflexive ethnography² in its data collection and analysis (Burawoy 1998). Thus, the field is the starting point. Not only did I observe the everyday activities of parts of manufacturing or teaching, but I also observed the relationships in the structures patterning interactions, for example in the job order or subcontracting given by multinational companies. The data collected includes 13 semi-structured interviews, descriptive statistical inferences from 33 questionnaires (from a total of 47 lecturers and instructors) and participant observation. Participant observation was conducted through an internship in the Polytechnic from 16 November 2010 to 17 February 2011.

Before continuing with the discussion, a clarification of the terms used is required. The term “knowledge” in this chapter will refer to the tacit knowledge³ (Polanyi 2009) produced by knowledge-based workers in the polytechnic field. In this sense, knowledge is a valuable resource in the area of production (and in the manufacturing process) (Bell 1999; Menkhoff et al. 2011). Additionally, the term “entrepreneurial” refers to an entity such as an organization which incorporates the practices and values applicable in the manufacturing sector (as part of the market) within the polytechnic field. My definition of what entrepreneurial is,

¹ Hence, I treat these knowledge producing organizations on an equal level for the purpose of sociological analysis. In addition, I start from the context, which in this case is the Indonesian context that situates these organizations on the same page. Conceptually they are different organizations. Polytechnics, as a part of the vocational education system, put more emphasis on the development of competence as human capital for the purposes of occupational work (see Fischer and Boreham 2008a). Universities, on the other hand, are often tied with the idea of an “ivory tower” and the production of scientific knowledge.

² The implications of using an extended method in the overall rubrics of analysis in the organizational research are: *Firstly*, one will encounter a dialogue form of discussion between the researcher and the respondents; *secondly*, critical thinking: I often asked myself whether the rendition or analysis of data is accurate, whether the questions I have asked suffice and are sufficient as a follow up. *Thirdly*, I acknowledge that my entrance into the field is also influenced by who I am. I am a female Indonesian who speaks fluent Indonesian and basic Javanese.

³ For a conceptual and empirical discussion of tacit knowledge, please refer to the third section of this chapter. I describe the first shift of tacit knowledge in manufacturing processes in this section.

thus, differs from the definition of entrepreneurship in, for example, the study carried out by Peterson and Berger (1971).⁴

The study shows how practice at ATMI Polytechnic Cikarang is shifting, with the actual orientation of work heading towards that of an entrepreneurial organization. It bears a resemblance to a supplier company. One needs to take an empirical look at how organizations such as polytechnic institutes produce knowledge and how this in turn affects the collaboration between academia and industry. For example, ATMI Polytechnic survives on the basis of being entrepreneurial in its function, as it produces tacit knowledge concerning parts manufacturing. This manufacturing orientation, along with its socially-embedded relationship with the community, enables collaboration between the Polytechnic and industries.

This chapter is divided into the following sections. The first section discusses the production-based education method in Indonesia's vocational education system. The second section investigates the conceptualization of entrepreneurial organization and academic organization. The third section examines the first shift of tacit knowledge production for the purpose of production. The fourth section discusses the second shift of integration further towards the market and how this has had an impact on the way a polytechnic works. The collaboration between a polytechnic and industry is the main focus analyzed in the fifth section. The last section sums up the discussion and provides issues for further research in the theme of organizational change.

1 Production-based Education Method in Indonesia's Vocational Education System

The existing literature discussing vocational education in Indonesia is relatively limited in terms of explaining the process of internal knowledge production in an organization and in terms of examining collaboration between academia and industry in Indonesia. Wilson (1991), for instance, analyzed technical and vocational organizations in Indonesia and Malaysia. Focusing on the *Sekolah Teknik Menengah* (or vocational high school), he conducted an analysis using time series data based on statistics from 1985-1986 and archival analysis of planning documents (Wilson 1991). He stated that Indonesia is in the lead compared to Malaysia in terms of the degree of interaction and involvement in curriculum

⁴ Richard A. Peterson and David G. Berger's study (1971) was based on the record industry and how it coped with turbulent market environments. It captured the three organizational strategies whereby organizations may adapt to entrepreneurship; first by segregating the environment-linked segment, second by isolating the entrepreneurial function, and third by limiting entrepreneurial liability. The study is cited due to its similarity of focusing on how an organization survives by greater integration into a market environment. Yet, in contrast to their study, I present herewith how the shifts or changes of organizational orientation have taken place in an intended or unintended manner.

reforms between local companies and technical and vocational academic systems. This is possibly due to the complex Dutch heritage in the academic system in Indonesia (Wilson 1991). On another level of reviewing the progress of the vocational academic systems in Asia, Tilak (2002) argued that Indonesia (along with other countries, namely Malaysia, Philippines, Thailand, and Sri Lanka) has “moderately developed” vocational and technical academic systems. Yet these studies focus more on access to academia and curriculum building rather than on knowledge management and linkages with external organizations. Organizational sociology has not been the focus of analysis in vocational education in Indonesia, especially in noting the changes arising due to the openness towards the market system and values offered from a production-based education system.

The application of a production-based education method (often phrased as production-based academic and training system) in Indonesia’s vocational education system is still rare. Generally, the higher education policy in Indonesia situates polytechnics on a par with traditional universities. This is apparent in the fact that polytechnics in Indonesia have to carry the *Tri Dharma* functions, which were originally designed for universities. They include teaching (*pengajaran*), research (*penelitian*), and community service (*pengabdian masyarakat*) (Buchori and Malik 2004). Situating polytechnics akin to universities may cause problems in terms of professional certification, as lecturers in polytechnics are obliged to do research as part of their function, similar to university-level lecturers. The policy has a macroscopic view in the sense that it neglects the value of a production-based education system. Indeed, rather than receiving research funding, production-based academic systems support themselves through production activities, such as accepting job orders (subcontracting) from industries. Hence, the majority (almost 80%) of the costs of education are subsidized by income from production activities (Jacobs-Foundation 2009). According to the latest data in 2013 from the Directorate General of Higher Education—Ministry of Education in Indonesia (DIKTI), there are more than 200 polytechnics in Indonesia, of which some 32 are funded primarily by the state (DIKTI 2012).⁵ However, to the author’s knowledge, up to now there are only two polytechnics that rely directly on market subsidies to cover operational costs. These two institutes are ATMI Polytechnic Cikarang and ATMI Polytechnic Solo. Organizationally, both polytechnics have similar structures in regards to having production-based education systems. At each, there are two directorates that play a significant role in the functioning of a production-based education system. They are the production directorate and the academic directorate. Yet, these two polytechnics are unique in that production or, to be more exact, manufacturing of parts⁶ has

⁵ See the following website for further information: <http://forlap.dikti.go.id/> (accessed 18 May 2015). PDPT is the portal for the higher education database (or *Pangkalan Data Pendidikan Tinggi*).

⁶ “Part” as a term in this chapter is used to refer to goods produced in the assembling mode, such as moulds, blow moulds, die casting, dies, special purpose machines, and jig fixtures. It also includes component spare parts, such as shafts, gears, flanges, and parts composed of ferro- as well as non-ferro-based materials (email communication with an instructor, 3 July 2011). This

become the central focus. As discussed later, job orders are a prominent channel of knowledge production in ATMI Polytechnics, to the extent that concentrated learning takes place in the production directorate and does not flow to the academic directorate. Moreover, distinct from other knowledge-producing organizations in the Indonesian science system (in this case R&D institutes and universities, which are dependent on state funding), the majority of operational costs are covered by the subcontracting activities of polytechnic institutes. Hence, apart from carrying out teaching functions, the polytechnics also resemble supplier companies in a supply chain. In this sense, they position themselves as supplier companies in the manufacturing market. Studying the organizational model of a production-based education system as a model of financing academia may be worth exploring as an alternative funding method amidst a climate of underfunding in the Indonesian science system.

A brief overview of the history of ATMI Polytechnic is warranted prior to going further in the discussion. The history of both polytechnics started with the ATMI Polytechnic Solo, Indonesia, which was opened in 1968 by three Jesuits from Switzerland: *Romo*⁷ Gerard Chetelat, *Romo* Paul Ammann, and *Romo* Johann Balthasar Casutt (Teiseran 2010). The idea for ATMI Polytechnic in Solo actually began in 1963 (Casutt 1991) with the help of the Franz Xaver Foundation in Zurich and was made possible by the cooperation of the Swiss Ambassador (Triatmoko 2009; Teiseran 2010). Upon receiving financial assistance from the Swiss Government and the Franz Xaver Foundation, the campus of ATMI Polytechnic in Solo was built in Karangasem Village. ATMI Polytechnic in Cikarang is a formally separate entity from the ATMI Polytechnic in Solo. The ATMI Polytechnic in Cikarang was established in 2001 by the same organization as that in Solo, namely the Karya Bakti Foundation, which is a Catholic organization of Indonesian Jesuits (Triatmoko 2009). It started its operational activity after receiving donations from the German government, Indonesia's business conglomerates, and ATMI Polytechnic alumni from Solo (Teiseran 2010).

ATMI Polytechnic Cikarang is located in the Jababeka Industrial Park in West Java, Indonesia. It is one of the largest industrial clusters in Indonesia. Initially, it was created to support manufacturing training and education for workers in Jakarta and Bekasi—part of the Jakarta metropolitan area (Triatmoko 2009).

Both polytechnics, in fact, were opened with the goal of providing education for manpower in the manufacturing sector and training for the Bekasi residents in general. Despite this initiative of providing training for manpower, most students

part can be a complete part whereby no further process is required (*barang jadi*), or an incomplete part whereby further processing and additional manufacturing is necessary (*barang setengah jadi*) (informal discussion with an instructor, Cikarang, 2 Feb. 2011). A common stand is that the production of these parts is based on the needs and orders made by industries. These practices of manufacturing and producing parts are denoted as job orders (interview with an instructor, Cikarang, 17 June 2010).

⁷ “*Romo*” is a Javanese term; in a Catholic-based education system, it is synonymous with the term “Father”.

at ATMI Polytechnic Cikarang, however, were not from the Bekasi area. In an interview with the former director of ATMI Polytechnic in Cikarang, he stated that the majority of the students were from Central Java, Indonesia. In 2010, out of the 27 students from the Jakarta metropolitan area, West Java and Sumatra, very few were from Bekasi, and even they were pendatang (incoming residents) who had not stayed in the area for many years (interview, Cikarang, 17 June 2010). Relations between the ATMI Polytechnic and locals living near the Jababeka Education Park were tense during the beginning of campus construction. One of the Polytechnic's assistant directors offered the locals free training in manufacturing-related areas, yet this was rejected. The locals then opted to take advantage of the waste from the parts produced there, including the materials that were not used, and this in fact yielded a more direct income for them (informal discussion, Nov. 2010). The offer of training, however, still holds to the present time.

The next section will examine two typologies of organizations: the entrepreneurial organization and the academic organization. The discussion in this section will also provide a basis for the empirical analysis.

2 Conceptualizing Organizations: Entrepreneurial Organization and Academic Organization

This section will illustrate two analytical organization formats: entrepreneurial organization and academic organization. For the purpose of the analysis, I argue that the inquiry of organizational knowledge production and academia-industry collaboration requires two foci of engagement. The *first focus* is the analysis of the epistemic culture (Knorr-Cetina 1999) and the actual work orientation of the organization itself, namely: *how it produces knowledge and how the existing social structure of the organization governs the orientation of production*. Yet, this type of micro-sociological approach has been criticized as an “internalist history of company” (Weingart 1988). However, it does not and should not stop there. The spatial dimension of knowledge needs to be captured in the analysis as well. To that end, the *second focus* is *how academia responds to the reconfigurations of the notion of space and scale* as one of the main motors of socio-economic transformation (Perry and Harloe 2007). This translates in the field to the notion of not only geographical space, but also social space (Bourdieu 1985, 1989) and cultural space (Meusburger 2008)⁸ which individual actors in industries use in line with their shared frame of reference to foster knowledge-flow processes.

⁸ Meusburger (2008, pp. 66–67) sees culture as a system that is not stable. It comprises signs and interpretations that also incorporate processes and take place in a constant motion. The shared frame of reference can be exercised through the usage of a language, such as Japanese, between first tier supplier and second tier suppliers.

Analysis in the discipline of organizational sociology should be more open in observing the process of knowledge production and knowledge sharing in entrepreneurial organizations. This is not only in terms of everyday knowledge production from a constructivist actor's perspective (see, for example, Hornidge 2007), namely in terms of the role of the self and emotionality (Newton and Smith 2002) that might affect knowledge sharing, or the organizational narratives, which are the main modes of communicating in organizations (Czarniawska 1998), but also in terms of different traditions, such as ethnomethodology (Turner 1970), which should be taken into consideration when observing knowledge-sharing processes in the context of formal and informal meetings.

Studies on entrepreneurial organizations have been carried out in industrialized countries. Entrepreneurial practices adopted by the University of Waterloo, Canada, have been captured in terms of its intermediary function through its Cooperative Education Program, which connects firms directly with students, tapping into experienced researchers who are attuned to the research and development needs of industry, joint research projects, and project-oriented consulting (Bramwell and Wolfe 2008). By defining an entrepreneurial university as a "university that has developed a comprehensive internal system for the commercialisation and commodification of its knowledge", Jacob et al. (2003) examine the impact of entrepreneurship in Chalmers University of Technology in Sweden. Problems range from accommodating values of commercialization of knowledge, ad-hoc trial of the Chalmers infrastructure for innovation and entrepreneurship, to the question of whether research should be treated as a public good or if it should be integrated into the sphere of knowledge production with the rest of the economy (Jacob et al. 2003, pp. 1563–1564). In Southeast Asia, particularly in Indonesia, the notion of "entrepreneurialism" in the science system has been dealt with primarily in the context of universities. Heru Nugroho (2012, p. 17), an Indonesian sociologist who reflected on his experience working at Gadjah Mada University in Yogyakarta, Indonesia, for example, refers to the lack of funding from the state for universities as a reason as to why lecturers and researchers look for extra income outside of their daily work. This propels the entrepreneurial character of how lecturers and researchers carry out their professional work (see also Nugroho 2005; Widmer 2007). A common strand in these studies is that polytechnics have not been a main theme of analysis in observing organizational shifts in the context of entrepreneurial organizations. Studies dealing with knowledge production in polytechnics have primarily been conducted through the lens of pedagogy or vocational education. This is exemplified in the case of Germany (Mueskens et al. 2009) and the UK (Boreham 2002). Hence, the analysis presented in this study aims to contribute to the organizational sociological analysis of polytechnics. In doing so, the following paragraphs will revisit some of the conceptual underpinnings⁹ of entrepreneurial organization and academic organization.

⁹ As stated earlier in this writing, I situate universities on par with polytechnics to grasp the idea of entrepreneurial organization.

From a pedagogical perspective, Clark (1998) investigated five universities: Warwick in England, Twente in the Netherlands, Strathclyde in Scotland, Chalmers in Sweden, and Joensuu in Finland. His method of inquiry was based on a dozen, more or less, interviews, review of documents, and observations, where possible, on the campus activities. He portrays how higher education institutions are being “pushed and pulled by enlarging, interacting streams of demand, universities are pressured to change their curricula, alter their faculties, and modernize their increasingly expensive physical plant and equipment—and to do so more rapidly than ever” (Clark 1998, p. xiii). He inferred five characters of the universities’ transformation in his study (*ibid.*, pp. 5–8): (i) an expanded developmental periphery in which one can see a growth of units including new non-departmental units, (ii) a strengthened steering core that is quicker and more flexible, (iii) a funding base that is diversified, (iv) a stimulated academic heartland whereby a modified belief system is adopted, and (v) an integrated entrepreneurial culture whereby universities develop a work culture-embracing change. The study has been criticized for a combination of reasons. Methodologically, Deem (2001, p. 16) considers that the theoretical framework offered by the case studies that utilized grounded theory lacks clarity with respect to the process of case-study data analysis. With regard to the organizational perspective, there seems to be a monocultural perspective emerging as the sole authentic view derived from those of senior managers (Finlay 2004). The study, however, provides a basis for observing how a transformation by market forces internally affects universities.

A differing sociological (sociology of communication and, generally, of innovation) perspective is the “triple helix” approach. The triple helix mode of innovation brings forth the conceptualization of an entrepreneurial university model. There is increasing linkage between the users of knowledge, such as industries and/or government bestowing a university/polytechnic institute a role as an economic actor (Etzkowitz 2008; Etzkowitz and Zhou 2008). The triple helix approach focuses on the network overlay of communications and expectations that restructure the institutional order between universities, industries, and government agencies (Etzkowitz and Leydesdorff 2000). Thus, it is a more fully informed (Leydesdorff and Dubois 2004) communication process between university industry and government as well as an evolutionary model (Leydesdorff and Etzkowitz 1998). This theory lends support to a functional approach (for a discussion see Luhmann 1995). There may be limitations to this triple helix approach with respect the observation of internal changes in an organization such as academia. Specifically, there is minimal attention given to history¹⁰ and to the micro level of social interaction that may play a role in knowledge production at the organizational level. The approach is valuable and warrants merit in the sense

¹⁰ As pointed out by Leydesdorff and Etzkowitz (1998), historical analysis is useful to the extent that one can reconstruct on the basis of existing comprehension how the actors can learn to control the prevailing contingencies. They then point out how evolutionary models do not focus on the historical contexts *per se*, but on the working of the emerging systems of innovation.

that the linear process of transfer from origin to application of knowledge is no longer considered as decisive (Leydesdorff and Etzkowitz 1998). This means that such a process is only tenable if it incorporates the possibility of non-linearity, i.e., that the application of knowledge could result in a two-way exchange process. Furthermore, as a research matter it opens up the possibility of a system having a self-organizing capacity beyond even government intervention or involvement. Applying such analysis to the linkage between universities or polytechnics with industries in an industrial cluster would be intriguing, as the starting point would be the belief that a cluster would have its own self-organizing capacity to stabilize the different linkages of knowledge flow. This entrepreneurial university/polytechnic model acts as the motor of the triple helix; it is not governed by the government or industry. Etzkowitz (2008) further explicates the norms that drive the entrepreneurial university as consisting of:

“First, *capitalisation*. Knowledge is created and transmitted for use as well as for disciplinary advance; the capitalisation of knowledge becomes the basis for economic and social development and thus of an enhanced role for the university in society. Second, *interdependence*. The entrepreneurial university interacts closely with industry and government; it is not an ivory tower isolated from society. Third, *independence*. The entrepreneurial university is a relatively independent institution; it is not a dependent creature of another institutional sphere. Fourth, *hybridisation*. The resolution of the tensions between the principles of interdependence and independence is an impetus to the creation of hybrid organisational formats to realise both objectives simultaneously. Fifth, *reflexivity*. There is a continuing renovation both of the internal structure of the university as its relation to industry and government changes and of that of industry and government as their relationships with the university are revised” (Etzkowitz 2008, p. 41).

There is, of course, criticism of the notion of an entrepreneurial university/polytechnic. Giroux (2001, pp. 1–3) contends that higher education must not be reduced to its entrepreneurial function, although public and private organizations should still be able to gain profit. It is necessary to defend higher education to maintain it as an autonomous sphere and for the progression of a critical and dynamic citizenry (Giroux 2001). Thus, empirical research is required to observe the impact of academia becoming more entrepreneurial; whether it would produce more “elitist” knowledge or whether it would become more like a corporation (see Dhliwayo 2010) following an economic logic. I have so far sketched the concept of entrepreneurial organization to conceptually situate the discussion of this chapter. In the following paragraphs, I will explicate the term academic organization.

Academic organization has often been employed as having several unique characteristics. It carries with it the idea of academic freedom. This can be understood as the scholars having the autonomy to pursue truth despite the fact that the findings they have might upset pieties (Fuller 2005). Furthermore, the student or lay public is protected from any obligation to accept the scholar’s findings (Proctor 1991; Fuller 2005, p. 30). Professionals having autonomy and control in the organization are also an essential feature. Baldrige et al. (1978, p. 25), for instance, illustrate how it has unclear and contested goal structures; almost anything can be justified and almost anything can be attacked as

illegitimate. It provides service to clients who seek input into the decision-making process and, in addition to this, they serve their clients the technology that must be holistic and non-routine, for this purpose it has a problematic technology. Henceforth according to them, it is an important case of a professionalized organization where professionals serving the clients call for a significant degree of control of the organizations' decision(-making) processes (Baldrige et al. 1978 as cited by Santos et al. 1998). This leads us to the idea of professional organization.

A professional organization can be distinguished from a semi-professional organization in several dimensions. Firstly, there is knowledge, which underpins the authority of professionals. Indeed, the basis of professional authority is knowledge, and the relationship between administrative and professional authority is largely affected by the kind and amount of knowledge owned by professionals (Etzioni 1969, p. xiii). Secondly, there is a goal, whereby in a professional organization the major goal activities are performed by professionals and are under the authority of professionals (Etzioni 1964, p. 86). Academic organization can be categorized as a type of professional organization yet with a multi-purpose designation. It does not only perform teaching, but also research. Specifically in the case of the polytechnic, it carries the purpose of teaching the students but at the same time it discharges the function of production. Etzioni's (1964, p. 3) analysis of professional organization starts from an understanding that organizations are social units that are deliberately constructed and reconstructed to pursue specific goals. This is an understanding he derived from Talcott Parsons' work of *Structure and Process in Modern Societies* (Etzioni 1964, p. 3). It is not only training and academic qualifications that carry weight in the context of knowledge for professionals, but also the actual work can add competence and skills in professionals' knowledge.

Concepts of entrepreneurial organization and academic organization may serve as a continuum to remind one of the shifts that are possible as a result of opening an academic organization to the market to fund the working and functioning of a knowledge producing organization. Later, I will show how a polytechnic is now actively seeking resources directly from the market and how it competes with firms (second tier suppliers) to accrue income. Yet how does this affect the culture of knowledge production within the organization? A study of the culture of knowledge production on an organizational level was carried out by Knorr-Cetina (1999). She demonstrated, among other things, how molecular biology was becoming a dual-layered organization with ensuing struggles bearing the mark of a territorial conflict among units managed by scientific persons (in this case laboratory leaders and individual researchers) competing for resources and success (Knorr-Cetina 1999). Practices of knowledge production located in everyday life, to the extent they are structured and interwoven in an individual's action, need to be integrated into the analysis of organization as well. The context of knowledge production is also spatial (Perry and Harloe 2007; May and Perry 2011). The local or regional level is the site whereby the dynamics of different knowledge capitalisms, from policy conceptualization to conditions of production, are most obvious (May and Perry 2011, p. 133). The process of knowledge exchange itself

is, as I will later show, also mediated by spatial context. Having explained these foci of analyses, the paragraphs that follow offer an empirical analysis of how a polytechnic shifts its organizational orientation. The initial shift is in regard to the production of knowledge which is oriented towards manufacturing purposes. The second shift is in regard to the incorporation of manufacturing practices into organizational work. The next section, hence, discusses the former, i.e., how tacit knowledge is produced and the tension that arises due to its production.

3 The First Shift: Tacit Knowledge Production in Manufacturing Processes

Oftentimes types of knowledge are distinguished on the basis of being tacit or explicit knowledge. The two, however, are correlated. Explicit knowledge requires tacit knowledge for it to materialize into action. In Polanyi's words: "Hence, all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable" (Polanyi 1969, p. 144 as cited in Rammert 2009, p. 275). Studies of organization, especially intelligent organization, have also been carried out from the perspective of management¹¹ (Willke 1999, p. 4). Nonaka, from a business perspective, contends that dynamic knowledge creation requires a certain degree of externalization and codification of, presumably, tacit knowledge (see Nonaka 1994). This study starts with the definition of tacit knowing as suggested by Polanyi (2009). It incorporates (i) valid knowledge of a problem, (ii) the scientist's capacity to pursue it, guided by his or her sense of approaching its solution, and (iii) for a valid anticipation of the yet indeterminate implications of the discovery made (Polanyi 2009, p. 24). I start with this definition as a starting point of my conceptualization of tacit knowledge. But as I will show later on, I expand it further based on my data to incorporate the subjective and objective elements of knowledge.

Discussion of vocational knowledge, especially tacit knowledge, attempts to surpass the concept of tacit knowing coined by Polanyi (2009). Stevenson (2001), for example, pointed out the deficiencies of tacit knowing in Polanyi's conceptualization. He stated how there are considerable problems linked with a strict and exclusive codification of any knowledge. He added that to say one can perform skills but cannot really confer how, as conceptualized by Polanyi, would be inadequate and lack clarity (Stevenson 2001, p. 655–656). By drawing on de Jong and Fergusson-Hessler's work (1996), he concluded that tacit knowing seems to occupy a central place in the "situational, conceptual, procedural and strategic knowledge of experts" (Stevenson 2001, p. 657). Their critiques are of

¹¹ In regard to this point, Helmut Willke (1999, pp. 4–5) added that a revival of the theme of knowledge society does not come from sociology or political science, but that it instead comes from management theory.

merit for this study in looking into situational know-how and in unfolding the notion of the organizational level of knowledge.

Knowledge production in the polytechnic field is geared towards the process of manufacturing. I substantiate this postulate by firstly defining knowledge based on the fieldwork conducted on the shop floor in the Polytechnic. I, then, characterize the type of knowledge produced. Based on this, I intend to show that there has been a shift in producing knowledge more towards the interest of manufacturing processes.

Knowledge in the present context is defined as the “know-how on techniques of processing and techniques of assembling” (informal discussion with an instructor, Cikarang, 1 Feb. 2011). This includes know-how of the technical details used in integrating components of produced parts in relation to a larger part (informal discussion with an instructor, Cikarang, 1 Feb. 2011). The typology of knowledge in this area of assembling is similar to the work process knowledge that is vital in vocational education (Rauner 2005; Fischer and Boreham 2008a, 2008b; Dehnbostel P 2008).¹² Thus, the idea of work process knowledge is to generate a real work environment, such as those used in production processes, for students and at the same time for the process of production.

My observations in the assembling area (Observation, Cikarang, 1 Feb. 2011) portray the subjective and objective elements¹³ of this tacit knowledge and further display how instructors and employees demonstrate caution and attention, especially when assembling different parts. They take time in measuring, often using scales and tracing the tolerance of materials. The picture resembles that of a scientist in a laboratory continuously observing the specimen under a microscope when conducting a set of trials. The instructors and employees do not require a manual. These unrelenting exercises and the internalization/embodiment of knowledge (*membadankan pengetahuan*) are guided by “feeling” (interview with an instructor, Cikarang, 17 June 2010). There is no manual, and one learns from continuous and repeated practice, which eventually establishes the feeling:

“The determination of the zero in every drawing is carried out by drawing (design). Yet these machines need feeling, so we could embody ourselves with machine and the manufactured parts” (Informal discussion with an instructor, Cikarang, 14 Feb. 2011).

¹² Work process knowledge as a specific area of competence of skilled workers incorporate, amongst others, the following traits: “firstly, it is the knowledge that it is directly needed in the work process (as opposed to e.g. systematically structured professional knowledge); secondly, it is mostly acquired in the work process itself, e.g. through experiential learning, but does not exclude the application of theoretical knowledge; thirdly, it comprises complete work processes in terms of the definition of goals, the planning, the performance and the evaluation of ones’ own work in the context of operational processes” (Dehnbostel p.447 as cited and translated from Fischer et al. 2002 p. 157).

¹³ I use the term “subjective element” to refer to an individual’s tacit knowing, which may include intuition. “Objective element” is utilized to allude to an organization’s collective way of (unwritten) knowing. The former can be illustrated in the determination of a part/product that does not meet quality requirements, whilst the latter can be seen from the common shared understanding of how to produce a product/part simply by looking at a drawing from an engineer at the Polytechnic.

The repeated emphasis on feeling in the discourses (and, as I observed, in action, despite the use of scales) denotes the intuitive character (Schoen 1983) of knowing. It is not solely rational and technical, but also relies on the internal-intuitive process at the individual level. Usually the intuitive level was modelled by a senior expert, who would observe a machine and then conclude that it was not working properly just by listening to its humming. Knowledge in this definition refers to applied know-how regarding the production of parts and would normally be kept tacit yet practiced by means of individual embodiment (*membadankan*), personal memory, and internalization. Thus, it is both the objective and subjective element of knowledge.

There are generally two groups of knowledge workers at ATMI Polytechnic, namely the instructors¹⁴ and the lecturers.¹⁵ The instructors at ATMI Polytechnic are engaged in both the routine of teaching students and the manufacturing of industry-related parts (see Fig. 1). In the following passage, an ATMI instructor explains how the two routines are inseparable:

“So in the Polytechnic, we based ourselves on vocation based academic training, students learn from practice. Then they are conditioned in the industrial world whereas in the beginning they learned competence on basic mechanic, then after being deemed as qualified they learn production. What they learn during the competence learning is applied in the production process. This production process is the job order that the Polytechnic receives” (Interview with an instructor, Cikarang, 8 Dec. 2010).

¹⁴ The instructors are divided to teach students from the first level to the third level. In the first level, the instructors are in charge of teaching the students the basics of technical manufacturing: engineering including milling, tooling, grinding, drawing, and heat treatment. At the second level, the instructors assist the students in the full production of parts. The second level consists of two cycles (*putaran*). Each cycle includes grinding (*bubut*), milling, learning at center for tools, welding and heat treatment (informal discussion with an instructor, Cikarang, 8 Feb. 2011). The emphasis again is on production. At the third level, the instructors assist students in the production of parts and in training them in different areas, such as pneumatics and electronics. These activities take place mostly in production. The activities of instructors are oriented towards practice rather than theory. The competence of instructors is assessed from an understanding of how to operate machines and produce parts for machines to the required standard of quality (interview with an instructor, Cikarang, 22 Nov. 2010).

¹⁵ The lecturers work within the theoretical realm of teaching. The curriculum for teaching at the Polytechnic is 30% theoretical and 70% practical. The lecturers teach the required 30% component. The lecturers are involved in class-based teaching of various subjects, ranging from material sciences to *Pancasila* (*Pancasila* designates the five values promoted at the state level of ideology in Indonesia). Some of these lecturers are professionals from the industrial sector, such as professionals in the field of progressive dies.

Fig. 1 Instruction given to a student (Source: author's fieldwork in 2010)

There are three segments involved in parts manufacturing in the polytechnic field, the first being polytechnic students (notably second-year students) becoming fully involved in production (own observation, Cikarang, 7 Feb. 2011). Secondly, the instructors at the Polytechnic are involved in the teaching of students and at the same time are involved in the manufacturing of parts. Thirdly, there are 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).

Based on the questionnaire distributed to knowledge workers, I have analyzed the process of learning through parts production that occurs at polytechnic institutes. More than half of the respondents stated that they are involved in the process of parts manufacturing. Of this share, most of the respondents stated that they did learn from being involved in the manufacturing process.

To what extent does learning from experience in parts manufacturing have an impact on organizational routine? The extent of the changes resulting from such learning will be measured by considering two features: (1) the method of teaching and (2) the writing of new scholarly articles.¹⁶ The results show that the changes affect the teaching methods rather than the writing of new scholarly articles. In regard to teaching methods, a large proportion of respondents affirmed that the

¹⁶ Only 18 respondents are directly involved in the manufacturing process, i.e. lecturers. The remaining 15 are lecturers who are mainly involved in teaching activities at the Polytechnic.

manufacturing process brings new ideas and changes to the methods of teaching. However, whilst learning from work in production brings changes in the teaching syllabus and methods, there has not been change in new scholarly articles prepared at the Polytechnic institute. Less than half of the respondents stated that the manufacturing process brings ideas and alterations to the publication of new articles.

This indicates that the process of learning is not codified in written form. It is not made explicit by means of the production of scientific knowledge. The fact that learning from work in production brings alterations to teaching methods is prevalent in the workshop. Most of the instructors provide advice and techniques to the students on how to manufacture the parts through direct face-to-face communication.

There is a propensity for instructors to hoard knowledge in a tacit format. I will describe this in the context of codifying knowledge to a teaching syllabus.¹⁷ The respondents that I interviewed stated their concerns regarding the problematic process of codifying learning in the teaching syllabus. One respondent expresses the extent to which the process can be written down and taught in a traditional context; this respondent also emphasized that competence should be the aim:

“I was bewildered by this requirement of teaching syllabus for the second-level instructors. Although I have spent a long time in the Polytechnic, the minute I heard that there should be teaching syllabus for the second level, how will we make it since we are in fact producing parts? What is a teaching syllabus? It is a process if I am correct. Analogous with subjects, physics for example have various formulas, models. It is a competence that needs to be understood and attained” (interview with an instructor, Cikarang, Feb. 2011).

The know-how on parts production is tacitly stored; new techniques are kept in one's head, managed through storytelling, not by being written down. Codify something in writing, with the exception of a drawing, is even at odds with the current practice of knowledge production and sharing in the workshop. The next paragraphs will explain the reasons why there is a limit to what can be expressed in a codified manner.

The absence of a standard part and product is the first reason. The nonexistence of a standard part manufactured on a mass-based production line is often given as a cause for the lack of a teaching syllabus and main guidelines for teaching (GBPP). It is difficult to codify this type of learning in a teaching syllabus and in the main guidelines for teaching because the products and parts being manufactured change accordingly with the orders that arise from a particular industry; no part has been standardized yet in the polytechnic field. However, what can be an object of assessment are one's operating skills and knowledge of machines, as well as the process of learning (informal discussion with the director, Cikarang, 1 Feb. 2011).

¹⁷ I focus on instructors in the second level who are both teaching students and fully engaged in production.

The second reason arises from the lack of organizational incentive, especially from the academic directorate. An incentive for achievement is the reward of monetary compensation after an annual performance appraisal. Indeed, what is practiced is very technical and applied. Namely, drawing, assembling and parts production are the daily techniques practiced by instructors (informal discussion with an instructor, Cikarang, Feb. 2011). For instructors, strategic knowledge is acquired in the assembling area, where all the parts are assembled, measured, and checked. This is the technique they master, *the (situated) know-how*. Assembling is situated in the UBM managed by the production directorate. Instructors associate themselves with the production directorate rather than an academic directorate. There is also reluctance to codify the learning in the form of a standard operating procedure (or SOP) for repeated parts/products (informal discussion with an instructor, Jan. 2011). A SOP can be developed at a later date and used as an academic teaching syllabus. I asked one of the key informants about the academic positions supported by DIKTI (Higher Education Directorate—Ministry of National Education), which may be providing monetary incentives for instructors. A respondent explained his lack of interest in the academic position or support from DIKTI. He stated that he cannot be confined by the regulations of academia. His perspective is that the workshop format (*bengkel*) provides more freedom, more knowledge, and more space for instructors to teach (informal discussion with an instructor, Cikarang, Jan. and Feb. 2011).

In response to this perception, efforts are being organized to tackle this issue. A respondent shared his experience of being trained in the *Pekerti* method. Several instructors and lecturers have attended the training. This *Pekerti* training is organized by DIKTI to provide lecturers (*dosen*) with skills relating to teaching (informal discussion with an instructor, Cikarang, Feb. 2011). The *Pekerti* training does not address the issue of changes in parts manufacturing nor does it address the strategy of codifying such learning. Yet another comparative study was initiated by the academic directorate during my internship in order to learn more about codifying learning and know-how in the teaching syllabus. The instructors and lecturers decided to go to the ATMI Polytechnic in Solo.

Researcher: “Why do you have to go to ATMI Solo to reflect on what you have here for teaching syllabus and main guidelines for teaching (SAP & GBPP)?”

Respondent: “Well, because we are not yet experienced like them in Polytechnic Solo” (informal discussion with an instructor, Cikarang, Feb. 2011).

After they returned from Solo, I asked what insight was gained in regard to the use (or lack of use) of a teaching syllabus at ATMI Polytechnic Solo.

“The problem in the Polytechnic in Solo is similar with us here. There is no teaching syllabus and main guidelines for teaching (SAP & GBPP). 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 with an instructor, Cikarang, Feb. 2011).

Thus, the remedies do not fulfil their assigned tasks. Neither of the efforts has been able to address the issue of codifying the learning and know-how in a

teaching syllabus. Consequently, it is the lack of a standard product and of organizational incentives that serve as the main causes of a lack of the codification of know-how into a teaching syllabus. The instructors hoard their knowledge in a tacit format and identify themselves as a part of the production directorate where they can acquire strategic knowledge. The dominant means of producing tacit knowledge as strategic knowledge are used for manufacturing purposes. This shift exhibits the difficulty or the *tension* when the organization cannot convert its function from an entrepreneurial system to an academic entity.

4 The Second Shift: Integration towards Manufacturing Practices

There is a second shift that is propelling the entrepreneurial feature of a polytechnic. I deal with two issues in discussing manufacturing practices in a polytechnic as an organization, namely concerning knowledge workers and parts manufacturing. The organizational analysis demonstrates how the specialization of their profession poses an arduous challenge to knowledge workers in a polytechnic. This, in fact, has curtailed the conversion of organizational work from an entrepreneurial objective to an academic agenda. The job order routines demand instructors to take up the role of supervisors apart from teaching. Two complications arise from this setup. First, they have to master a wide array of skills required to fulfil their job. Secondly, due the first complication, it would be a burdensome task for them to achieve specialization. I discussed this issue of specialization with one key informant who is an instructor.

“The job order usually would have been organized by the PPIC. I also teach in the classroom. I am confused though, am I an instructor or a lecturer? I feel more like an industry supervisor. This has impact on my motivation. In here there is no specialization, such as drawing, or mould or dies or precision parts” (informal discussion with an instructor, Cikarang, Feb. 2011).

The measurement for the assessment of performance of lecturers and instructors are the same with the employees. The human resource division assesses performance based on work quality, work quantity, competence, work behavior, independence in working, and initiative in the office, health and safety and cleanliness as well as neatness. The term “competence” is not defined further using this yardstick (interview with a human resource division officer, Cikarang, 10 Jan. 2011). Upon researching specialization, I found there was no satisfying answer provided. Assessment of achievement is based on work performance and is rewarded with monetary incentives (interview with a human resource division officer, Cikarang, 8 Dec. 2010).

The lecturers face challenges in regard to research and development. The emphasis has been on skills: students’ skills or individual skills. In one instance, a lecturer tried to convince the academic directorate of the importance of research,

but received a response doubting the function of research, which was the result and influence of on-going activities in the research and development department (informal discussion with a lecturer, Cikarang, Feb. 2011) of a polytechnic institute. A key informant states: “If we do research, what is the reward for us?” (interview with an instructor, Cikarang, 22 Nov. 2010). Currently, there are no credits provided for lecturers when they produce work such as papers or when they update their teaching modules. This is also the case for instructors who perform class-based teaching. Due to the lack of organizational incentives, there is a widespread reluctance to update teaching modules based on tacitly kept know-how (informal discussion with an instructor, Cikarang, Jan. 2011).

Several respondents voiced their concerns. They stated that it is quite burdensome to acquire academic positions at a polytechnic (informal discussion with a lecturer, Cikarang, Dec. 2010 and Feb. 2011). In fact, these academic positions are, at the moment, non-existent. Moreover, there is an emphasis on practical and vocational systems within a polytechnic. The Polytechnic has responded to this need for academic positions and for codifying the teaching process and know-how in the academic teaching syllabus predominantly due to the external demand of accreditation from DIKTI (interview with an assistant director, Cikarang, 17 Feb. 2011). Academic positions have been created as a priority at the Polytechnic starting in 2012 as part of the accreditation process (interview with a human resource division officer, Cikarang, 8 Dec. 2010). The non-recognition of academic positions within the internal structure of human resource management has a significant impact as well. Lecturers at the Polytechnic cannot apply for scholarship opportunities provided by DIKTI, nor can they move up the organizational ladder to achieve academic specialization in a certain field.

What exists in the academic system in the Polytechnic thus is a hierarchical ladder of upward career mobility. A person is readily moving up from instructor, to section head, coordinator of the level/*tingkat*, and then to division head (informal discussion with an instructor, Cikarang, 13 Dec. 2010). The current job evaluation system and job-grading programs also do not capture the horizontal mobility allowing for specialization and ranking of different levels of competence. This exhibits another feature of the academic organization as a hierarchical one. This work organization, which is not completely Taylorist (see Littler and Craig 1978) in character, affects the career structure in the Polytechnic.

The next issue is the organizational setup of parts manufacturing, which is governed by market needs (and thus is profit-oriented). I refer specifically to the usage of the term “non-technical factors,” which has been used since the start of my internship in mid-November 2011. This term came up frequently during lunch conversations with key informants or during informal discussions when I was interning in the instructor’s office at the workshop.¹⁸

¹⁸ Written documents, such as books on ATMI Polytechnic papers written by the personnel of the Polytechnic on the flow of parts manufacturing do not discuss or write about this non-

The expression “non-technical factors” refers to the manufacturing practice governing the parts being produced. The investigation of what constitutes non-technical factors started by asking for the definition as understood by respondents. During one informal conversation in the instructor’s office, the following definition was given:

“Non-technical factors are the decision relating to materials/parts for work (*benda kerja*) and the decision regarding the compensation hours for students (if they manufacture faulty parts)” (informal discussion with an instructor, Cikarang, 8 Feb. 2011).

Pedagogy ignasiens is one of the non-technical factors affecting parts production. The parts produced are used as an exercise (*latihan soal*) for students. The knowledge required for students regarding which part to manufacture can depend upon the given part’s level of difficulty. For example, if a part is too complex, it can be postponed and other relatively simple parts can be produced (informal discussion with an instructor, Cikarang, 8 Feb. 2011). This is consistent with the *pedagogy ignasiens* inherent in the Catholic-based system used in the Polytechnic.

“Well, I can only describe the basics, humanizing humans, so more to *cura personalis*. Each individual is different, so some sort of individual approach is used. When we face groups, for example, we may generalize like a machine but with this (*pedagogy ignasiens*) we can differ the approach, for those students who are a bit slow to learn, or require particular approach, we can personally approach them” (interview with an instructor, Cikarang, 8 Dec. 2010).

It has become a rule of thumb that students will be punished for faulty parts (NG or “Not Good”) they produce by being “charged” hours in compensation. The number of hours depends on the price of the materials employed. This personal approach also is evident in a case where the instructor had already set hours of compensation for a student for an NG part. The instructor assessed the part in detail, relying on his tacit knowledge.

A good relationship (*hubungan baik*) is also a non-technical factor in successful manufacturing education. A respondent explains how maintaining good relationships with customers is key in the manufacturing of parts (interview with an employee, Cikarang, 14 Feb. 2011). On further investigation into *hubungan baik*, one respondent explained how this works by citing cooperation with an industry whereby a majority of the workers are alumnae of the Polytechnic. This type of relationship can facilitate the *hubungan baik*. In other words, the parts ordered from this actor sharing the same alma mater can be prioritized (informal discussion with an employee, Cikarang, 21 Nov. 2010).

The setting of priorities is the next non-technical factor. Once a part is labelled as top priority or urgent, then there is an issue of lack of time. In this case, there is usually no briefing for students. This has been evaluated by the unit in charge of production at the Polytechnic:

technical factor. The researcher recorded to the best of her ability these numerous informal discussions on the non-technical factors in the field notes.

“The NG level has a high percentage during the period of March-December production in 2010. The main cause is due to human error from students and employees. Why are there erroneous mistakes from students? It is due to lack of supervision, tools are limited, so students improvise and end up with NG parts, also due to a lack of detailed briefing, competence of students for machines is insufficient, this is because the basic is from manual machinery, no adequate base in CNC machines” (field notes during monthly meeting, Cikarang, 27 Jan. 2011).

I brought up this issue of lack of briefing to an instructor involved in parts manufacturing. He elaborated the reasons for this occurrence:

“Lack of briefing? Oh, that is because we do not have much time in here, and the parts we have to manufacture are urgent. Orders came from PPIC and UBM. I know the function and tolerance of materials and machines, the standards are fixed. Look, some students in here can work on grinding, some cannot” (informal discussion with an instructor, Cikarang, 1 Feb. 2011).

The parts to be manufactured seem to be of such great significance that they might compromise the learning process. The practices of setting priorities for parts would lessen the chance nature of briefing and may be influenced by *hubungan baik*.¹⁹

It is inevitable that the Polytechnic as an organization learns best through the manufacturing process. When this is the case, then the *pedagogy ignasiens* seem to be compromised and the entire system of the organization functions more like an industry focusing on the output of parts production. However, in those cases when the pressure to produce parts is not so prevalent, the academic facet returns and *pedagogy ignasiens* approaches can be emphasized for the benefit of students.

The manufacturing practices suggest that the intended dual role of the Polytechnic as an industrial and academic organization has shifted. The actual work that the knowledge workers engage in, the difficulty of specialization, and the non-technical factors of parts production all work to give the organization the orientation of an entrepreneurial organization.

At this juncture, then, one has to ask whether the output of the Polytechnic consists in the graduates or the parts. Ideally it should be both. In one discussion where a network is drawn by participants, the student is written as one of the actors with the least influence, but in the end, they become the object. One of the participants came forward and stated the following:

“We often said that the product of the polytechnic is the students. In reality, they are the ones who carry out the system. The parts are the measurement of their competence (*pembanding*). We evaluate the parts they produce. But for the priority in parts manufacturing, they become the object” (informal discussion with an instructor, Feb. 2011).

The organization, hence, survives due to its entrepreneurial layer that keeps the machines and the individuals working on the shop floor. It is in this entrepreneurial facet that the Polytechnic nurtures collaboration with companies. This is explained in the next section.

¹⁹ This *hubungan baik* or good relation is facilitated by alumni relations.

5 Socially-embedded Relations: Collaboration with the ISE²⁰ Company

Knowledge also has a spatial dimension, and the exchange of such knowledge may be governed by social space (Purwaningrum 2013). The ISE Company (or simply put, ISE) is located in the Tangerang, Banten, Indonesia. The Polytechnic itself is located in Jababeka, Cikarang-Bekasi, Indonesia. These two organizations are located around 74 km apart. The parts manufactured by the Polytechnic for ISE are molds. These molds are utilized by ISE for headlights of motorcycles and accessories for equipment associated with the light-lamp system of motorcycles. From the design provided by ISE, engineering staff at the Polytechnic became informed about the development of Honda products, the company for which ISE is a supplier (interview with an instructor, Cikarang, 21 Nov. 2010). It is through the design and drawing of parts that the engineering department at the Polytechnic becomes acquainted with the new models requiring a complex mold. Thus, the drawing and designs are the knowledge obtained from the job order process (interview with an employee, Cikarang, 21 Nov. 2010).

Apart from the design, tacit know-how is acquired by way of engineering visits, mediated through visualization of parts manufactured in the assembling area of the UBM. In most cases, the engineers from ISE would usually visit the Polytechnic to provide advice, or one of the staff of UBM would visit ISE (interview with an employee, Cikarang, 3 Dec. 2010). The interaction and meeting mostly take place in person, not via ICT. Sometimes the discussions with engineers from ISE are at the assembling area and problems in parts are examined. Frequently, the staff from UBM can ask about the dimensions of the mold and the techniques of production, which are not always written in the drawing (observation, Cikarang, 14 and 15 Feb. 2011). Thus, this engineering visit and direct meeting are the key features of the exchange of knowledge between ISE and the Polytechnic.

ISE has assisted the Polytechnic since 2006 in terms of employee training. It took more or less two years for the staff of the Polytechnic to fully comprehend and then be able to work with ISE. In the early years of the consolidation of the Polytechnic in Cikarang, a course in Japanese was offered to the employees. Despite the fact that most of the companies filling the job order are foreign-owned Japanese companies, lack of interest was still an issue. A contrast is the case of German, where most of the employees, instructors and staff speak German, as some of them have been sent to Fischer A.G. in Zurich, Switzerland, for a one-year internship. In this way, the deficiency in the mastery of Japanese serves as a barrier to accessing know-how (informal discussion with an assistant director, Cikarang, 22 Nov. 2010).

²⁰ I can only refer to the company by the initials ISE, as was agreed with respondents during the fieldwork.

Quite a number of ATMI Polytechnic Solo graduates work at ISE (informal discussion with an employee, Cikarang, 3 Dec. 2010). The respondent then explained in detail how ISE is open for the staff of the Polytechnic to learn, including in *genba* (walk-in process in the shop floor/production plant) and in accessing the shop floor. This bond, forging trust between the Polytechnic and ISE, permits access to learning on the shop floor. The strength of the relationship is indicative of an embedded social relationship, to the level it is not about the geographical proximity but more of a social space (Bourdieu 1985) enabling the interaction for the knowledge flow process.

The cooperation between ISE and the Polytechnic illuminates the importance of embedded social relations in the exchange of tacit knowledge. The know-how of mold manufacturing is shared using designs, mediated through direct meetings with individuals in a company and visualization of problems or parts in the assembly process. Nonetheless, the lack of mastery of Japanese serves as a barrier to full knowledge sharing. The know-how from ISE is retained in its tacit form, being limited to those who are directly involved in the production process at the Polytechnic, in this case, the engineering division, UBM and instructors at the second level who were involved in the production. Alumni relationships, as demonstrated in this case, show an embedded social relationship that enables the social space of interaction between academia (the Polytechnic) and industry.

6 Concluding Remarks: ATMI Polytechnic Subsumed by Production Orientation

This study is about the organizational change of academia. To sum up, ATMI Polytechnic is an organization that is defined by its orientation towards production and shaped by shifting practices from academic teaching to parts manufacturing. The liberalization of higher education in Indonesia exerts pressure on the survival of academia. The history of ATMI Polytechnic in Cikarang was marked by a Jesuit mission aiming to enable access to education at the vocational level.²¹ I argue that one needs to look empirically at the paradigm and structure (of knowledge production) as well as the space enabling collaboration between academia and industry. ATMI Polytechnic attempts to survive despite the overall liberalization of the education sector in Indonesia. It survives by subsidizing its education function by taking on job orders (subcontracting activities).

The organizational shifts towards being more entrepreneurial are framed analytically in terms of the shift in practice concerning the production of tacit knowledge and concerning manufacturing practices internalized in organizational

²¹ This is also evident in the process of constructing the new Loyola building in the complex of ATMI Polytechnic in Cikarang. Part of the ceremony is the three *Romos* (or *Fathers*) and the representative from the funding company holding the four pillars of the future construction on 31 July 2011. This in a way symbolizes partnership.

work. In this case, knowledge production is illustrated in everyday interactions, and tacit knowledge is produced on the basis of situated know-how about parts production. Instructors repeatedly promote the internalization of “feeling” or intuition in the mastery of certain skills. This tacit knowledge embodies the subjective and objective elements in this type of field. It is palpable that manufacturing of parts is the main vehicle for the production of knowledge. Tacit knowledge, however, tends to be hoarded. It is not made explicit in the format of a readily-accessible teaching syllabus.

The next shift is in the actual work of the organization, which is geared towards manufacturing. This is identified in two ways, namely the specialization of a profession and the logic of producing parts. In the former, most of the instructors identify themselves as part of the production directorate. This is due to the absence of non-vertical administrative positions, lack of an overall soft-infrastructure to codify tacit knowledge in the teaching syllabus (such as organizational incentives) and standard products. In the latter, the non-technical factors governing parts manufacturing are sketched. These range from *pedagogy ignasiens* and good relations to setting priorities. The second shift sets the manufacturing of parts as a priority, which may compromise the learning process for students.

The interaction with a company, as exemplified by this case study, is fostered by job order requests and pushed by alumni relationships. The embedded social relationship harnessed through an alma mater weave the social space of interaction between academia and industry.

The shift in practices blocks the possibility of such an organization converting from an entrepreneurial organization to an academic one. The more a polytechnic relies on parts manufacturing to survive, as shaped by the everyday practices of the instructors and employees, the more it will be subsumed in being entrepreneurial, forgetting its initial aim of the teaching and academic training of students.

The organizational analysis presented in this chapter unpacks what emerges at the micro-level in a state opening to a liberalization of higher education in a knowledge-based economy. This raises the following issues for future research: What kind of contribution would vocational education bring towards promoting product innovation, especially in light of the difficulty of specialization in a profession in Indonesia? Next, to what extent can the market (re-)orient the type of knowledge being produced by an organization (i.e., academia) meant to produce knowledge to strengthen the knowledge base of an industrial cluster?

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