

# The competitive advantage of the violin industrial cluster in Cremona

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## ABSTRACT

Located in Northern Italy, the town of Cremona is one of the world's greatest violin making clusters, dating back to the 16th century; to the father of violin making, Andrea Amati. The violins in Cremona made by his protégés, Stradivari and Guarneri, are still played today by top performers, adding an essential part to the art of music performance. This paper explains the advent of craftsmanship, the source of competitive advantage (Porter 1998) , and the dynamism of human communication resulting from experimental studies in Cremona.

Having explored the dynamism of the source of craftsmanship in Cremona, the premise is that specific knowledge can be promoted in the international industrial environment where all members compose a “Ba (Interactive Field) ” or the platform of communication through daily face-to-face information exchange made possible by geographical proximity. Furthermore, a wide variety of individuals with skill and knowledge helps bring a greater dynamic to the “Ba”. Certainly, these resources brought intellectual development to the culture and social capital of Cremona.

This integration of intellectual communication has taken place exclusively within the specified geographical area. It is due to the intellectual development of the “Ba” in and around Cremona that its violins have elevated in quality and value as highly sought after instruments. These contributions to the culture of craftsmanship in Cremona have succeeded. Even with the contemporary development of communication system, the necessity of human communication supports the successes and innovations of craftsmanship.

Key words: industrial cluster, competitive advantage, innovation, transformation of knowledge, skill

## 1. Introduction

Located in Lombardia in the Northern part of Italy, Cremona is one of the world's greatest violin making clusters. Its history dates back to the 16th century when Andrea Amati gave birth to the contemporary violin. The violins made by his protégés, Stradivari and Giuseppe Guarneri del Gesu, are still played today with honor by top professional performers, adding an essential part to the art of music performance. From the mid 17th century to the mid 18th century, Cremona maintained its own autonomy and flourished as a harbor between Venice and Milan, even though the city had been under

the rulings of either Milan or Venice according to the periods. Stradivari and his colleagues released their soon to-be-admired instruments during the Golden Age. However, as soon as Cremona's power faltered, violin makers spread throughout Italy, which led to a difficult period for Cremona's violin industry. Cremona finally revived as a manufacturing origin of violins during the post Second World War era. It is almost certain that this shift was prompted by the foundation of a violin making school which was proposed by Mussolini, and opened in 1937. This act, however, did not bare immediate results. It was after the 1970's that the town revived as the place of manufacturing. Presently, approximately one hundred and thirty violin making studios are officially registered, and the craftsmen are estimated to number seven hundreds.

This paper examines the competitive advantage achieved with innovation by industrial cluster. Its main focus is the experimental study of the violin industry in Cremona. Porter (1998) recognized an industrial cluster as a geographic concentration of interconnected businesses, and associated institutions in a particular field. The perception of cluster focuses on the essentiality of a region in improving competitiveness. At the same time, it is drawing increasing attention in recent years as a concept which provokes innovation spurring mature economies, as well as revealing the criticality of location in comparison with globalization.

## 2. Review of the former researches and the framework of this paper

### 2.1. Review of the former

Industrial accumulation was first argued by Marshall (1890). Marshall pointed out that geographic concentration of economic activity would produce an economic efficiency named external economy; (1) The market of skilled workers emerges, (2) The investment cost is reduced with the advent of supplemental industries and efficient use of expensive machineries, and (3) The spread of technology promotes simplified information transfer.

Pioneering industrial accumulation research flourished in the 1980's and thereafter, Piore and Sable (1984) found the manufacturing industry of Central and North-western Italy called the Third Italy as a typical example of flexible specialization, which consists adjustment functions such as (1) the combination of flexibility and specialization, (2) the restriction of participation, (3) the encouragement to competition to promote technology innovation and (4) the prohibition of competition which may disturb technology innovation. He adds, considering the 19th century in which craft production shifted to a mass production system as the first industrial divide, present days will be regarded as the second divide. Subsequently, Krugman (1991) modeled the variables focusing on economic geography. Marshall considered these variables as external economies, and insisted that the advantage of industrial

accumulation further improves due to the efficiency from external economy. Furthermore, Saxenian (1994) recognized Silicon Valley as a regional network system, and Route 128 as an the independent firm- based industrial system, and insisted that a regional industrial system has such aspects as (1) local institutions and culture, (2) industrial structure, and (3) corporate organization, and that a region should not be regarded as a mere aggregate of production factors.

In comparison with such classical industrial accumulation theories described above, Porter (1998) coined the term “cluster” for the industrial accumulation of a particular industry from the viewpoint of a corporate strategic approach, taking it as a paradox of globalization. In spite of people’s belief that the advent of information technology resolves obstacles from distance and physical limitation, even the information technology industry is geologically concentrated in the Silicon Valley and the Silicon Array.

Porter proposed four attributes of a cluster for Diamond Model, namely (1) demand conditions, (2) factor conditions, (3) firm strategy, structure, and rivalry, and (4) related and supporting industries. The “Diamond Model” stems from the argument that competitiveness originates from productivity increase. Also, it stands on the possibility an industrial cluster improves productivity through competition and cooperation prompted by the effect of “rivalry, and related and supporting industries,” which potentially provokes innovation. According to Kanai (2003) , the industrial cluster theory differs from the traditional accumulation theories in the following accounts. (1) This new theory points out the importance of a new knowledge-based productive factor in addition to classical industrial factors such as land, labor, natural resources, and capital. (2) This theory covers and is applicable to a wide range of organizations, and is compatible with a transition to a knowledge-based society. (3) This points out the significance of the productivity increase generated by innovation. (4) This theory emphasizes not only the cooperative relationship with the related and supporting industries, but also the significance of competition.

Innovation is a term for a new utilization of creative intelligence, the outcome of human beings’ ability, namely originality and ingenuity. Schumpeter (1912) coined “new connection” for the basis of innovation, and suggests the following components; (1) introduction of new products, (2) introduction of new production methods, (3) opening of new markets, (4) new supply sources, and (5) industrial reorganization. In addition, Allen (1977) ’s research on communication patterns seen in innovation process points out that “gatekeepers” play a material role in promoting innovation process. Though the mechanism in which industrial accumulation promotes innovation has not been necessarily revealed, Camagni (1991) introduces a perception, “ innovative milieu”, and while based on location in close proximity, considers individuals, groups, organizations, and organization relationship as environmental factors, and that the entire milieu’s ability for innovation improves by rising a feeling of belonging to the network, and through learning; prompted by the accumulation and synergy. From the viewpoint of organization theory, Itami (1998) also points out mechanisms particular to industrial accumulation;

amount of technology accumulation, low cost for dividing labor adjustment, less challenges to open businesses, and most importantly, acquisition of a single “Ba (Interactive Field)” which can accommodate intense and fast-coming information to be stored and to be shared by people. According to Miyazaki (2005), intelligence and knowledge, the sources of innovation, can be produced from a variety of creation actors, and these creation actors are not only exploration and learning ability, but also the organization of these agents, which is largely influenced by the level of spirit held in the “Ba”<sup>1)</sup>.

## 2.2. The viewpoint of analysis in this research

The research on industrial clusters has shifted its attention to dynamism of the economic efficiency from intellectual accumulation, in which advanced information exchange is taken place at a “Ba”, utilizing it as a platform. However, partially due to its wide coverage of the research fields, the exploration of the dynamism has not been necessarily organized, and individual empirical research is still needs to be collected. The former case studies were conducted primarily in Silicon Valley and the “Third Italy”. Japanese researchers have been gradually revealing this mechanism: craftsmen and small to medium sized enterprises which made their sophisticated design possible studied by Okamoto (1994), comparison of industrial accumulation between Silicon Valley and Northern Italy, importance of community compiled by Kiyonari and Hashimoto (1997), strong unity among families, areas, industries, and local communities suggested by Ogawa (1998), Inagaki (2003)’s industry accumulation theory associated with the chain reaction of spin-off, and Kojima (2007)’s research on implicit knowledge of Italian production areas. However, not everything has been revealed as approximately two thousand industrial clusters are located alone in Northern Italy. Given this, this paper picks up Cremona’s violin industrial cluster, and explores competitive advantage, taking the dynamism of “Ba” from the viewpoint of innovation. Though Cremona’s violin making school has been largely studied from the viewpoint for music study, there is no research from the viewpoint of business economics.

This research adopts Porter’s Diamond Model to Cremona’s competitive advantage as a basic framework. There are factor conditions such as natural resources, climate, location, mature and or immature labor, and capital, and advanced prerequisites such as digital data communication infrastructure, resources with advanced knowledge, and research institutes. Demand condition means customers with advanced and high demand level. To respond their high demand standard, enterprises and organizations must introduce innovation. Firm strategy, structure, competition with competitors<sup>2)</sup> include the circumstances to encourage adequate investment, sustainable development, as well as

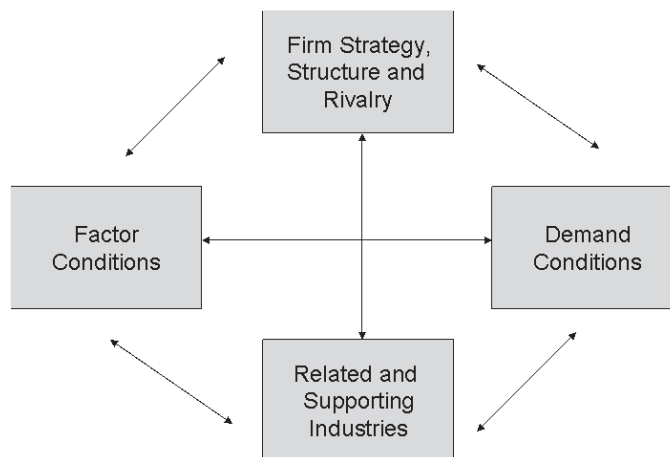
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1) “Ba” means an interactive field

2) Hereafter, Will be regarded as business strategy and competitive environment

motivation of their workers. Supplemental industries indicate skilled suppliers and competition among them. An industrial cluster is a place where people share knowledge, and formulate transformation of knowledge. Certainly a cluster's economy would not be activated only by discovering and analyzing these four attributes; however, Porter considers that a cluster economy provides the best business environment for nations and or regions to enhance productivity of the organization hence improving living standards for the general population.

This paper will empirically reveal how innovation promotes competitive advantage, in an attempt to integrate two conflicting strategic approaches; the position view and the resource base view. The strategy of industrial clusters is regarded as a single process of knowledge transformation by connecting the external and internal contexts.



[Chart 1: Diamond Model by Porter]

*The source: Porter M.E. (1990)*

Furthermore, since their product is an influential musical instrument to the art of music, discussion should cover how violins have incorporated with commercial world, improved added value, and established their brand. This research chronologically explores how Cremona has established the source of competitive advantage as a production origin by forming and utilizing “Ba” as its platform. The dynamism of economic efficiency from intellectual accumulation will be partly revealed by discussing competitive advantage and exploring intelligence involved in Cremona’s production activity from the viewpoint of technology transfer and innovation.

### 2.3. Method of research

This paper was composed on the basis of case studies conducted from 2005 to 2007. First, the

analysis framework was constructed over a wide range of primary and secondary references. Based on the analysis framework, detailed qualitative and quantitative research was adopted, targeting a few actual instances. This research style combining detailed case study and quantitative study offers the advantages of both hypothesis finding and hypothesis testing, deductively leaning introduced theories.

The qualitative study was composed with interviews with more than seventy string instrument craftsmen and the several personnel in the violin industry residing in Cremona<sup>3)</sup> on the subjects of individuals, groups, organizations, inter-firm relationships, relationships with customers, competitors, suppliers, and the violin making school, and technology, aiming to reveal the dynamism of industrial cluster as a platform. As the quantitative study, questionnaires were distributed primarily to approximately one hundred thirty craftsmen registered to Cremona's string manufacturers' association, of which seventy were answered; the answer rate was 53.8%. Cross tabulation was used to survey these results.

The features and problems sorted out from the quantitative study were further investigated with secondary interviews to compensate the survey result. Refined results have been obtained from this methodological triangulation combining detailed qualitative study and quantitative study in this paper.

### 3. Innovation of industrial cluster in Cremona

#### 3.1 The source of innovation in the days of Stradivari

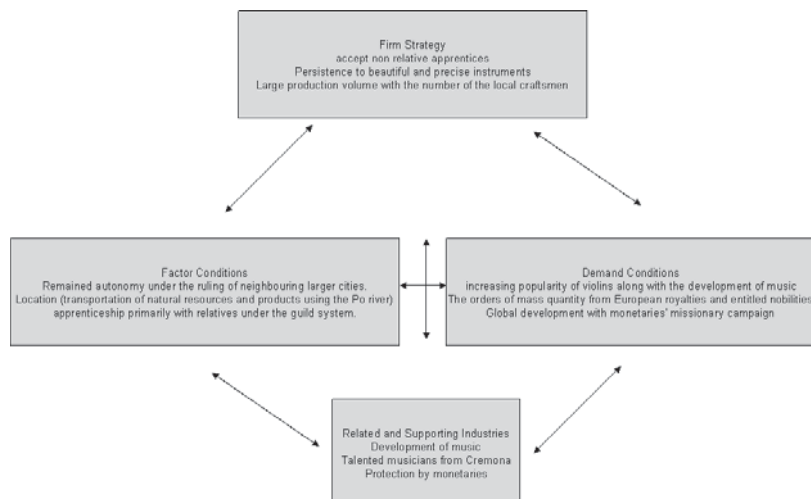
A number of masterpieces were produced from the studios of Andrea Amati, Stradivari and Giuseppe Guarneri del Gesù. Cremona does not produce maple trees nor spruce, the best material for violins, and the humidity rises as high as 90% in winter. The climate itself is inadequate for violin production. The secret of how such masterpiece could have successfully completed in the days of Stradivari largely remains mystery still today. What realized this feat was not generally accepted mystic secret of varnish. Innovation surpassing over skill transfer was only realized with complicated integration of various social factors, customers, suppliers, cooperation and competition in the cluster. Only historical references explain how Cremona flourished its violin industry, and continuously produced creators of masterpieces.

The source of innovation can be illustrated, applying Porter's Diamond Model as in Chart 2. Factor

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3) Interviews were conducted to the principal of violin making school, the representative for Consorzio (association for commercial craftsmen), Museums and Cultural Affairs Councillor of the Municipal Council of Cremona, Conservator of The Stradivarius Museum, and the chief of Stauffer Foundation in Cremona, and the owners of several string instrument retailers, the dealers, the manager of Custom Workshop design division of Toyooka Plant, Yamaha Inc., salespeople of music businesses, and the principal of Kiso-fukushima violin school.

conditions would be that despite the influence of its powerful neighboring areas, independent unique culture had remained in Cremona, wood material was available taking advantage of the location as a port of the Po River connecting Venice to Milan, that there was a flow of cultural figures, and that technology had been precisely handed down from master to apprentices who were the master's relatives along with the guild system. What should be raised as demand conditions would be that subsequently with the development of musical art, organization of performers enlarged. Musical concerts demanded wider range of instruments, and string instruments became popular to be in orchestras. Royalty and entitled nobility of European countries made orders of a large number of instruments for missionary activities of monastic orders. As business strategy and competitive environments, the competition principle was functioning, inviting outsiders into their cooperative community while giving priorities to masters' relatives to differentiating themselves from competitor production areas with beautiful precision. Furthermore, a massive volume of instruments were distributed with an equivalently large number of violin makers in Cremona. At the same time, there were advantages from development of musical art as well as composers from Cremona such as Claudio Monteverdi. Besides, violin makers were financially protected by Carmelite and the Society of Jesus. The violin makers did not have to worry about their finance thanks to monastic orders, and was given orders by royalty and entitled nobility. They could concentrate themselves for manufacturing using excellent materials. Every one of these condition was integral to innovation of Cremona.



[Chart 2: The source of innovation in the days of Stradivari]

Those instruments created in this era are still highly applauded as masterpieces. Approximately six hundred violins, Stradivarius alone, are preserved still today. Markets are trading them in millions of

dollars having collectors and performers as customers. Cremona's innovation was realized with the contemporary social systems, development of musical art, location, global market, excellent suppliers, cooperation and competition in the studios as well as information exchange among craftsmen. Besides, Cremona facilitated itself as a "Ba" where skills and information are shared and accumulated in the form of knowledge transformation.

### 3.2. The source of innovation in the new violin era

In Cremona, craftsmen disappeared after Golden Age. Having a long time of Dark Age, violins started to be manufactured upon the foundation of a violin making school in 1938. At that time, there was neither a tool nor materials in Cremona. The first graduates of this school such as Francesco Mario Bissolotti, Giobatta Morassi, and Scolari Daniele, who are great modern maestros, established the environment little by little, and the conditions for a production origin were gradually meeting. People started to choose vocation regardless of their relatives' jobs, and those who would like to pursue crafting enter the violin making school. Many of such young prospective violin makers gather in Cremona, and learn how to use tools and to extend their expression. Cremona's product range has widened and market has been expanded. What Cremona is today was realized by the innovation of new instrument era in 1970's and thereafter. Presently, Cremona is the only place in the world where violin makers can make their living only by manufacturing violins.

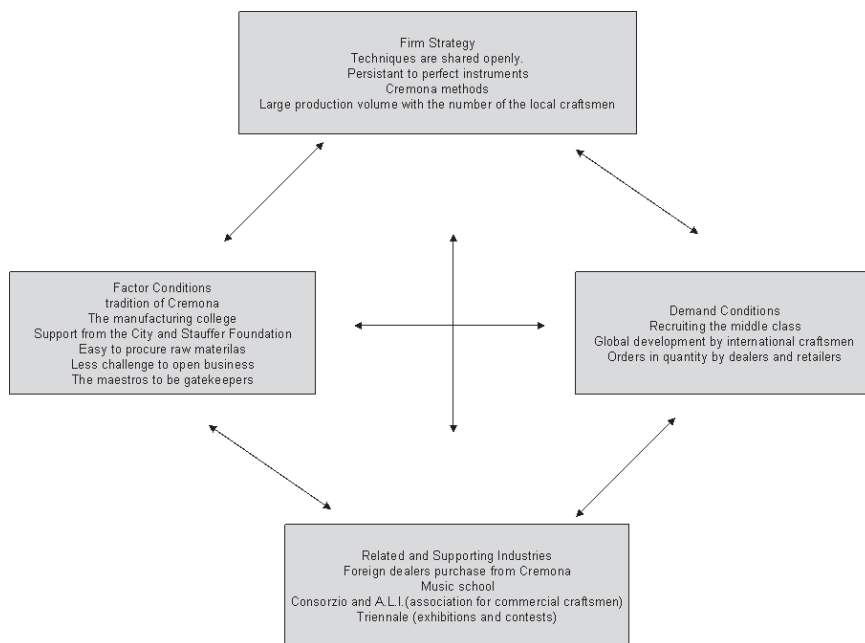
Chart 3 illustrates the source of Cremona's innovation using Porter's Diamond Model. Factor conditions would be namely the violin making school which teaches skills restored as implicit knowledge from Stradivari and others as "formal knowledge", and high quality material wood from mountains near Slovakia where Maetro Morassi is originally from<sup>4)</sup>. Also now Cremona craftsmen have easy access to raw materials from suppliers who visit triennale, can easily open their own studios and start business, and have maestros who facilitate as gatekeepers. Demand conditions are consisted of expanded demands from the middle class, reflecting developed music education for armatures and students. Multinational craftsmen have established sales routes and the cluster has developed globally. Now Cremona has acquired mass orders from dealers and instrument retailers. These dealers and instrument retailers issue request of such shapes as they can sell more easily. As for business strategy and competitive environment, technology is openly shared all around the industrial cluster. Their completely hand-made instruments are differentiated from increasing mass production in elsewhere. Besides, the other factor will be renaissance movement back to traditional Cremona style. Their production volume is large since a number of violin makers are concentrated in a cluster area, and

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4) Morassi sells his materials to other violin makers in Cremona



Cremona is generously accepting foreign students. As factors classified as supplemental industries, the following elements should be raised. Talented suppliers, dealers and retailers are choosing Cremona to wholesale their merchandise from. Local music college is educating professional musicians. Network is established by the foundation of Consorzio (association for commercial violin makers) and A.L.I. (association for cultural violin makers) . Triennale are held every three years for exhibition and craftsmen contests. Consorzio is promoting to unexplored markets for market expansion, and is issuing certificates to prove that the entire production process of the certified product is engaged by a single craftsman, which is motivating manufacturers to produce better instruments. With all the factors above, quality of Cremona's string instruments are improving, and so as the living standard of violin makers. In addition, these factors are consistently upgrading by the support from local governments, the support for violin making school and music schools from Stauffer Foundation, and support to Consorzio by local chamber of commerce.



[Chart 3: The source of innovation in New Violin Period]

#### 4. Discussion

Having explored the dynamism of the source of two past innovations in Cremona, Cremona's competitive advantage can be revealed as follows. Establishment of competitive advantage is dependent

on how the existing technology and knowledge can be converted to create new technology and knowledge. The transformation of knowledge can be promoted at international industrial environment where the members are composing a “Ba”, and through face-to-face information exchange made possible by their geological proximity on the other. Furthermore, a wide variety of individuals with technology and knowledge helps the “Ba” even dynamic.

Now let us look at Cremona in its Golden Era, and how it became the birthplace of Stradivarius and equivalently highly applauded masterpieces. While Italian culture and tradition were restored, a global market had been formed with a massive influx of visitors from large cities, enhanced by the contemporary Christian missionary campaign. On the top of the regional artistic passion, violin craftsmen were provided with financial incentives offered by aristocrats. Besides, their studios were located in the specified neighborhood. This close geological proximity literally overwhelmed the guild tradition of handing down skills from the masters to their apprentices behind the closed doors; Daily face-to-face physical integration had enabled the transfer of knowledge among the violin makers. Cremona craftsmen did not refuse new comers with “foreign blood,” which resulted in discovering and maintaining the wide diversity of talented craftsmen. At the same time, this skill-oriented community promoted the transformation of knowledge, which conveyed more knowledge and information than the contemporary family-business type technology transfer. The resulted accumulation was pooled in the form of intellectual resource, and grew so immobile from the region that it became too complicated be relocated to outside of the region. Certainly, this intellectual resource grew increasingly incorporated with the culture and social capital of Cremona. This integration of intellectual communication exclusively taken place within the specified geographical area is considered to be enabled the highly value-added products from Cremona.

The fascinating implication from technology transfer and innovation can be seen also in the passage which Cremona has been taking to revive as a production center. Cremona has become a Mecca of violin production with its brand originated from the tradition of Stradivarius. The network of skilled craftsmen is functioning well and forming cooperative relationships facilitated by the top maestros who serve as their gatekeepers. Beside their cooperative efforts, competition is another prerequisite to industrial cluster. The local violin making school surely can instruct some substantial violin making skills; however not implicit knowledge. Most of the graduates enter apprenticeship to acquire the implicit knowledge in the day-to-day work in the maestros’ studios till they become ready to open their own production studios. Some violin makers rather choose jointly run a studio with their fellow craftsmen. Whatever the choices they make, walking distance from one studio to another accustomed these violin makers to get together over the coffee at “Bars” from time to time, taking them out from their rather solitary violin manufacturing project. Thus, this custom reduces the risk from the

informational blockage. The geographical proximity of industrial cluster generates mutual trust, as well as competitive spirit associated with peer pressure, which vitalizes overall spirit of the organization itself.

Furthermore, the diversity of resources is creating further dynamic “Ba”. The local violin making school is generously accepting foreign students and discovering talented violin makers. These foreign-born violin makers are inspiring the local Italian manufacturers, and improving the technical level of the cluster in general. Cremona’s violin industrial cluster is taking advantage of this diversity of craftsmen for marketing purpose as well. Unique to Cremona, violin makers themselves are taking a part of marketing and sales activities. Every violin manufacturing studio is an equivalent to an independent enterprise, not a subcontractor. Today, Cremona’s violin has expanded their sales routes to global market. This achievement was realized, in a part, from the effort accumulated by the foreign born violin makers to establish the sales routes for their instruments.

The diversity of Cremona is also seen in the three local maestros who are facilitating as the gatekeepers of this industrial cluster. Each of them is an extremely talented manufacturer, and has different strength; technician type expertise, a talented dealer, and a great consultant for learner craftsmen. The dynamic “Ba” should not be realized only with manufacturing expertise, but these violin makers who provide generous efforts for retailing their products and educating peer craftsmen. Many other craftsmen cover a wide range of sub-divisions to support violin making and retailing, namely material distributors, repair experts, instructors, marketing-oriented publishers, and those who promote violin industry from political side. Cremona violin makers are engaged in a wide range of business as a means of pursuing each of their perception about what contribution a violin maker should make. This is creating the dynamism of this violin industry as a result. It can be said that Cremona violin manufacturers are creatively exploring themselves in different roles and pursue their respective goals.

However, there are some problems in the current state of Cremona. The local violin making school opened their door to international students, which triggered the Wimbledon phenomena. As a result, their competition spread to worldwide. Craftsmen who spun off from the “Ba” of Cremona spread to the world, and they are trying to catch up Cremona’s quantity<sup>5)</sup>. Since Cremona is open to share violin making skills with the rest of the world, the violins produced elsewhere is getting too similar to distinguish. Conversely with foundation of the violin making school, their “implicit knowledge,” the extremely advanced technical information of violin making, was enabled to be converted into “formal knowledge.” This time, it is needed to turn their “implicit knowledge,” into strength, taking the advantage of their geological proximity where face to face information exchange is feasible. To maintain

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5) Those students who studied in Cremona have gone their homes in China, for instance, and started to run mass production plant using Cremona’s manufacturing methods. Because of this, the quality of mass production from china is remarkably improving in recent years.

competitive advantage, it is necessary to further pursue Cremona's uniqueness by accumulating their highly immobile knowledge in the "Ba", learning each other based on "embedded knowledge" implanted in their personal relationships and culture.

My survey revealed that the traditional method which craftsmen would like to conserve is different from Cremona's tradition<sup>6)</sup>. Also found was, while involvement of dealers is strong, involvement of musicians is insufficient<sup>7)</sup>. It is obvious that Cremona Method regarded as Cremona's tradition is solely a word created for commercial purpose; Stradivari's manufacturing method is not currently preserved in Cremona. Besides, no violin better than Old Instruments has been made yet. For the development of this industrial cluster, new instruments which are even better than Old Instrument has to be produced. Highly demanding market requires the concert level specified for professional use in terms of tone, volume, and clarity also with beautiful in terms of both shape and visually appealing. For Cremona to achieve innovation in the "Ba" as a platform of information and resources, it is necessary to extend the involvement with highly demanding performers and to create value-added products which can stretch the performer's expression. Dealers typically demand less expensive instruments which they can sell in quantity. The maestro's daily instruction, as well, is focused on the shape, not sound<sup>8)</sup>. However, violins are instruments, and the performers, who are the end users, demand the quality of sound.

For Cremona's further development, it will be necessary to accumulate the top maestro level manufacturing skills on the foundation of Cremona's tradition. It will be also essential to promote knowledge transformation to create new highly immobile knowledge. Cremona will be able to survive as a violin manufacturing origin through persistent incremental innovation. The Cremona's violin making school is featured in developing the students' ability to distinguish beautiful instrument from others; not good ones from others. Personality is highly valued in Italy. While teaching basic manufacturing skills, the maestros are encouraging their students to express themselves by making violins. What is required most in musical instruments production is uniqueness of each instrument, which widens the variety of sounds. Expression of the producer's uniqueness will add values onto the musical instruments. Upon this belief, Cremona is open about sharing their skills with the rest of the world as a means of their school. Individual taste is the system of individual's aesthetic feeling and sense of value. That is why no instrument will be the identical to the other. I suggest that they create further value added products to

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6) 46.3% answered that they would like to persistent to the traditional methods. (Though 19.4% answered "I am not persistent to them," my research did not reveal what methods the people commonly call traditional method.

7) 57.6% answered that they are usually doing business with the specific dealers. Conversely, as many as 68.1% answered that they don't think they are rather accessible to information despite of the number of musicians residing in Cremona.

8) Please note that 41.4% answered that they would like to pay attention to e sound, and 57.1% answered both the shape and the sound, and 1.4% answered the sound; more craftsmen would like to pay attention to the sound than shape.

be played for artistic use from material of upmost quality, investing more time and attention. For the survey question "Do you want to make great instrument which will be passed on to later generation, even it will not be sold?" the 50.9 percent responded "yes" and the 47.4 percent answered "no". This answer must be reflected from the reality and the craftsmen's enthusiasm towards innovation. As in the time of Stradivari, new instrument better than Old Instrument will be first created once they desire to self-actualize themselves as craftsmen also with its correspondent financial incentives. While the craftsmen are aware that great instruments require cost and time, they are standing on the dilemma between self-actualization and cost. Presently, the quality of mass-produced instruments is improving remarkably. To maintain competitive advantage of Cremona in such era, there is no other way but continuing incremental knowledge-based innovation. If they could acquire the route to both suppliers who are targeting customers in the middle class, and collectors for investment, it is expected to motivate these creators to improve the product's added value, and to promote sustainable development of the cluster with new sales routes. What direction creators pursue matters the survival of the cluster.

## 5. Conclusion

The purpose of this study was to empirically reveal the dynamism of innovation which becomes the source for competitive advantage. Old Violins, primarily created by Stradivari, are presently still evaluated as the greatest masterpieces. However, the course those violins took to complete to be such highly value-added products remains mystery still today. Under such circumstances, this paper explored Cremona cluster's technology-based innovation which requires advanced information for instrument manufacturing in terms of "Ba". First, it explored the knowledge in the current manufacturing in Cremona from the viewpoint of technology transfer and innovation by examining historical records. This reconfirmed the cluster's materiality and advantage of "Ba" for face-to-face information exchange. This sort of information exchange can not be substituted by information technology, and at the same time, is the core of the information exchange.

Intelligence, the source of innovation, originates from a wide variety of creation agents. Creation agents are not only ability to learn, but also influenced by each individual's value, relation with his or her organization, and the spirit of the "Ba". Cremona has great maestros who are the core of the personal network. Cremona would not be what it is today without these maestros. If we want to have new piece better than former masterpieces, "Ba" has to do more than just accumulating the technology of the current top maestros. For the further development of Cremona, it will be necessary to promote competition among craftsmen, and to create products with high added values which attract customers. To make this realized, appropriate amount of cost and time have to be invested. On the other hand,

there is a limit to the number of violins a craftsman can produce, and the craftsmen consistently stand on the dilemma between cost and value. Stradivari created approximately twelve hundred violins in his life. Quantity is another prerequisite to penetrating its brand in the market. To produce a mass amount, it will be essential to introduce new technology, and they should leave an option to implement division of labor as practiced during the days of Stradivari.

Violins take an important role in the musical art. My investigation confirmed that the dealers are deeply committed to the networks connecting it with the exterior world, and that the involvement of well-skilled musicians is insufficient. I suggest that appealing to collectors and achieving a position as an art piece will contribute the development of Cremona Cluster. Combined pressure from both their peers and demanding customers will be integral to the quality improvement. Those customers of string instruments are suppliers, performers and collectors. Cremona violins will be further more evaluated once new Cremona products catch attention of Old Violin collectors. Cremona craftsmen should prioritize to create such violins to be played by top performers.

The variety of taste is integral to musical instruments. The taste reflects who the craftsmen are. Stradivari and Andrea Amati attempted new techniques, breaking through the existing mainstream methods. They were not only artists but assisted many of their protégés. What was born from them was the masterpieces. I expect that Cremona again produce such artists who are motivated for knowledge transformation by passing their acquired artistic sense, skills, and knowledge down to the later generation. Innovation is sourced from personal resources which create knowledge. They have to have challenging spirit and the energy for it. At the same time, “Ba” is contributing for innovation in terms of information exchange particularly in violin’s production behind closed doors. At the “Ba”, the craftsmen can exchange skills and information of the markets. Industrial cluster functions as a “Ba” which connects a wide variety of personal resources, products, and supplemental industries each other, and develops their market to worldwide. A cluster can continually provide environment which assists spiral development centered in personal integration. Absolute competitive advantage can be achieved in such industrial cluster.

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