

Marcin W. Staniewski  
Wyższa Szkoła Finansów i Zarządzania w Warszawie

Kiyokazu Nakatomi  
Chiba Prefectural Togane Commercial High School in Chiba, Japan

## Organisational entrepreneurship, management philosophy of local company in Japan

### Summary

Nobuo Ogawa, a local entrepreneur in Japan, started from the pharmacy field after the Second World War then developed it to the Nichia Company. Today, Nichia is a world renowned company in the development of the blue light-emitting diode. Prior to this development, Ogawa of acumen adopted Shuji Nakamura. Nakamura strongly proposed to Ogawa to invest in his research a large amount of money and to allow him to study in the United States. Ogawa immediately accepted it. Nakamura went abroad and after returning home, he researched the blue light-emitting diode. This investment was successful in 1993. Nakamura completed his research of the mass production of the blue light-emitting diode in just four years. Today LED is used as a light illumination everywhere in the world and the blue light-emitting diode has allowed numerous innovations in many useful fields. Owing to the development, Nichia became a world enterprise. Nakamura was awarded the Nobel Prize in Physics in 2014.

We wish to expand on the encounter of Ogawa and Nakamura and the successful process of the making of the blue light-emitting diode

**Key words:** Nobuo Ogawa, Shuji Nakamura, Nichia, entrepreneurship, blue light-emitting diode, mutual respect.

**JEL codes:** L26

### Introduction

On the 10<sup>th</sup> of December 2014, two Japanese and one American were awarded the Nobel Prize in Physics. The reason of the award is the development of the blue light-emitting diode. Today, LED is used as a light illumination everywhere in the world. It needs only a quarter of conventional power and can provide lighting with even only the use of solar panels as a power source in the deserts of Africa. LED is an invention of the future as the conservation of energy for lighting. This development overlaps the discovery of these three researchers. One of them, an American Shuji Nakamura (1954~), currently professor at the University of California, Santa Barbara, was born and grew up in Tokushima Prefecture in Japan. Prof. Nakamura devised a mass production method of crystal diode. So he has been awarded the Nobel Prize for this development which was a series of hardships. He was employed as

a researcher at Nichia Corporation, a local Japanese company. After about ten years, he appealed directly to Nichia Corporation president, Nobuo Ogawa for the development of the blue light-emitting diode, which had been said to be impossible. Nobuo Ogawa readily agreed on the spot. As well as acceptance of the study of Nakamura in the United States, he granted him an unprecedented research expenses amount of 300 million yen (about 2.1 million euro)<sup>1</sup>. This bore fruits, the development of the blue light-emitting diode was successful. By his talent and efforts, Prof. Nakamura received the glory of the Nobel Prize. But it could not have been achieved without the support and determination of the entrepreneur Nobuo Ogawa.

In this paper, we wish to focus on this acumen of Nobuo Ogawa and explore the philosophy of entrepreneurship/management that outlooks 100 years, not just for profit.

## Entrepreneur Nobuo Ogawa

According to Drucker (1999), a business activity is a feature and behaviour of an entrepreneur or enterprise characterised by readiness and an aptitude for making decisions and solving new problems in a creative way; it is also the ability to take advantage of new opportunities and adapt flexibly to a changing environment. Entrepreneurship leads to the development of enterprises, improves the productivity of labour, and contributes to the creation of new technologies, products, and services (Brzeziński 2007). Entrepreneurial behaviour is characterised by initiative, action, autonomy, and innovative approaches that are demonstrated in private and public life as well as at work. It also involves the motivation and determination to achieve goals, personal and common, public and private (Dimitriadis 2008).

The example of the entrepreneur defined above is Nobuo Ogawa<sup>2</sup> who was born in Anan City in Tokushima Prefecture in 1912 (Nakashima 2003). He graduated from the local current Tomioka West High School and then the School of Pharmacy at the University of Tokushima. Then he was subject to military service as an Army pharmacy officer. First he went to Manchuria, then he did the rear support in the battle of the Solomon Islands. At the end of the war, he was posted at Bougainville Island in the Solomon Islands. His final rank was Army Major in pharmacy. During the war, Ogawa had a singular experience there. It was his encounter with fluorescent lamps. In 1942, the first time in his life, at a hotel of Mindanao, Philippines, he looked at the bright fluorescent lights and he was surprised. It was manufactured by the American General Electric Company (GE). He wrote in retrospect: *“I ... had watched the lamp. And I was thinking of making these things when the war ends”* (Nakashima 2003: 35).

<sup>1</sup> On 9<sup>th</sup> January 2015. Foreign exchange rate 1 euro = 141 yens.

<sup>2</sup> Darkness and nothingness continue to infinity ~eternity~transcendental-being~love. We call this the principle of Nothingness and Love. In this case, darkness and nothingness continue to infinity, eternity as lighting of the blue-emitting diode. Then Nobuo Ogawa faced Buddha, transcendental-being, in Awa dance and loved Prof. Nakamura. This realised the mutual respect (Love). We develop this further in the text.

In the tragic darkness of war, in essence of nothingness (Nakatomi 2002)<sup>3</sup>, Ogawa found the light. In 1946, somehow he returned home. He worked at Daikyo Oil (currently Cosmo Oil Corp.). Then, he opened a pharmacy in his hometown. In 1953, he started the delivery of high purity calcium chloride produced from local limestone by Kyowa Hakko Kogyo (currently, Kyowa Hakko Kirin Corp.). Kyowa produced streptomycin from it. By the income obtained in his business, he produced and sold fluorescent phosphor (calcium phosphate) for fluorescent lamps as seen in the Philippines. He delivered this to the New Japan Electricity Corp. (Shin Nihon Denki Corp.). In December 1956, he established Nichia Corporation and he was appointed as president. The phosphor that he produced with great energy was of high quality. In the United States, GE Inc. owning the basic patent praised the workmanship. In 1968, he tied up with GE Corporation and established a technical assistance agreement. In addition, with collaboration with Sony Corp., he helped to bring Nichia to a world leading manufacturer of fluorescent phosphor for lamps and TV cathode ray tubes. He left the president seat to Eiji Ogawa, the husband of his eldest daughter, in 1989 and he became chairman. He died at 90 years old of cerebral infarction. By the achievements he brought to the Nichia Corp. in Anan and grew it to a global company, he became an honorary citizen of Anan.

The classmate of Ogawa in Tomioka West high school was the former Deputy Prime Minister (1993), Masaharu Gotoda (1914-2005). He recalled Ogawa in his “My resume” in the series in the Japan Economic Times publishing Company in 1991: “*I played judo well with Ogawa, he had both abilities in studies and sports. Ogawa was the most excellent classmate*” (cf. Nakashima 2003: 34). In addition, Gotoda had introduced the sentence of “*Nobuo Ogawa genuine entrepreneur*” to Bungeishunjū<sup>(3)</sup> in February 2002. He wrote that the belief of Ogawa was “*Not doing things as written in a book and do what you have not written in it!*”. To do what you have not written in a book means new and creative things (Nakashima 2003: 36). Ogawa had a strong belief and was trusted by his classmates. Still more he would be said to be an innovative person full of creativity. “*Aim to the World*” was a favourite phrase from peacetime.

The meaning of Nichia is Nichi (day) for “Nippon” and the initial A for Asia, America and Australia. It does represent the thought of the shouldering seas and countries around Japan. With the view from the world, it is expected that the company also could persist and be active after 100 years. According to the Anan mayor, Yoshihito Iwasa, “*the belief of the founder and the acumen of Nobuo Ogawa have taken the world by storm*” (Iwasa 2010: 1). Nichia currently has a capital of 46.7 billion yen (about 3.3 hundreds million euro), sales of about 309.6 billion yen (about 22 hundreds million euro) and a total asset of 623.5 billion yen (about 44.2 hundreds million euro). It currently employs about 8,000 workers. The company that began as a local pharmacy in Japan, within fifty years, broke through as a global enterprise. Nobuo Ogawa had laid the foundation. In 2014, Nakamura said, when he was awarded the Nobel Prize, in an interview, “*I am grateful to Ogawa Nobuo, Nichia former president, for his support to my research*” (The Mainichi Shimbun 2014a). Ogawa decided

<sup>3</sup> Bungeishunjū Ltd. is a Japanese publishing company known for its leading monthly magazine Bungeishunjū. It grants the annual Akutagawa Prize, one of the most prestigious literary awards in Japan, as well as the annual Naoki Prize for popular novelists.

the development of Nakamura's research in the long run rather than short-term profits. His basic philosophy is the creation of a "*company that also survives and is active after 100 years from the view point of the world*" (Iwasa 2010: 1).

Referring to the entrepreneur ideas of Nobuo Ogawa, we wish to define the ideal entrepreneurship:

1. Think about the management not only in the short term but also in the long run.
2. Encouragement to the failure. If a man wants to achieve a big success, he must not fear failure. He needs the challenge spirit.
3. Generosity for the employees. As a company generating profit is required but the contribution to the local community is also needed. The positive participation to the Awa dance festival is the proof. And for the researchers, when they do not produce results, an entrepreneur should still regard them favourably and support them.
4. High ambition. The leader should keep the high ambition. Nobuo Ogawa aimed to the No. 1 position in the world. Naturally patience is needed in the intention.
5. Consideration for the employees. In the 1970s, Ogawa allowed the employees to take vacations of up to 20 days. At that time, the average working time in a year was 2400 hours but Ogawa admitted 2000 hours. He matched the working time for the employees to the international average. This is a proof of the deep consideration for the employees. It means that the leader should be a humanist who loves the employees with respect.

By these conditions and working environment, Ogawa succeeded to establish the Nichia Company. Well, what is the blue light-emitting diode that Nobuo Ogawa had expected?

## Blue light-emitting diode

As the blue LED is already practically used worldwide, it does not need to be explained much. Christmas night illuminations, traffic lights, PC, TV, electronic equipment, we see a wide variety of applications. In particular, the colours of the traffic signals contribute to safety (Newton 2014). Green becomes clearer and more legible than the conventional red and yellow. In the case of the conventional light bulbs, the light passes the filter of each colour, red, yellow, and green. However, in this method, when low angle lights such as sunrise and sunset do enter, all colours appear to be illuminated. But by the use of the blue LED, all colours in the signal become visible clearly. Apparently traffic safety increased at least in Japan. The life span of LED is far longer than the conventional light bulbs. In addition, energy-saving effect is the best. LED lighting needs a quarter of the energy of conventional fluorescent lamps. Speaking into the extreme, lighting power of the world will require only a quarter in future.

In recent years, 'vegetables factories' that use the LED are running. By the light of LED wavelength suitable for the growth of vegetables, the growth of vegetables is accelerated. Moreover, as the heat generation that hurt the vegetables is reduced, we can shorten the distance of lighting to the vegetables. As such, we can cultivate more vegetables in a narrow space. If we turn to the sea, incandescent bulbs for fishing lights to collect fishes, squid and

saury, etc. can be changed to LED lighting. For capsule endoscope that man can swallow in the medical field, LED requires only a small amount of energy, therefore a small size. The damage to the patient is less. Blue-ray discs that can store a large amount of information are used every day. LED in this way, beyond the level of electrical appliances and lighting equipment, extends to agriculture, medicine, and the society as a whole.

Since the basic blue LED technology was introduced, more than twenty years have passed. However, this development has not been easy. Red and green diodes have been developed in the 1960s already. But blue diode could not be developed yet. The problem was the production of crystal of gallium nitride. For focusing on gallium nitride, Prof. Isamu Akasaki was successful for the blue light-emitting diode the first time in 1989. Although many researchers went through trials and errors, finally they gave up. Prof. Akasaki continued the research patiently. Gallium nitride unlike diamond does not exist in nature (Akasaki 2013)<sup>4</sup>. It is created artificially. Crystal raw material is gaseous. Then the gas is blown to the sapphire base at about 1000 degrees Celsius. However, a different process was necessary to increase the purity. Prof. Hiroshi Amano, a disciple of Prof. Akasaki, accidentally produced a thin film (buffer layer) during an experiment, when the temperature dropped. This film effected to raise the purity. However, the practical use was still remote. Prof. Nakamura injected the raw material gas from the side on the buffer layer. Then he blew inert gas from the top to avoid convection of the raw material gas. This method is called two-flow MOCVD (Metal-Organic Chemical Vapour Deposition). Furthermore, after the high strength electron beam irradiation and heating of the crystal, he succeeded in mass production of high purity gallium nitride by adding a fluorescent layer mixed with indium.

Prof. Akasaki created a blue light-emitting diode for the first time. However, the succeder in the mass production was Prof. Nakamura. He began to research the blue LED in 1989 at Nichia. Four years later, Nichia invented the blue light-emitting diode in 1993. It was revolutionary at about 100 times the brightness of the antecedents that were produced. The supporter of this research, strictly speaking, the provider of funds, equipment, and other necessities is Nichia. In a sense, Nakamura is a member of Nichia. Its president is Nobuo Ogawa.

## Entrepreneurship philosophy of Nobuo Ogawa

Ogawa hired Nakamura in 1979 on the recommendation of Prof. Tada of Tokushima University. At that time, Nichia was a typical local company in a close contact with the local community. When it came to the lunch break, the majority of the 200 employees could drive back home for lunch. Employment is a local human priority. There were part-time workers in the agriculture. When the busy agricultural season started, they worked in their field without giving prior notice or receiving permissions. But they were not blamed (Nakashima

<sup>4</sup> Prof. Akasaki represented accurately material gallium nitride that “*has not been found in nature until now*”. However, it is not now confirmed, it may be verified in the future. It becomes possible existence. On earth, it is or it is not? To explain this situation is the logic of the transcendental nothingness that we preach. If man says that it is, it exists. If man says that it is not, it does not exist. Man can say nothing. It transcends relative being and relative nothingness. It means that it is beyond the words. We call such logics the logic of transcendental nothingness (absolute nothingness).

2003). At a later date, they would only say “*I worked in a rice field*” (Nakashima 2003: 26); the company allowed them. The atmosphere was so generous. Summer vacation was three weeks (exceptional in Japan), the employees had been known to practice the Awa dance (Nakashima 2003)<sup>5</sup> during this time. However, at that time the enterprise was medium-sized. The office building was located in a pine forest and looked like a shack, no better. Nakamura had been assigned to the Development division, it was a total of three employees. An elder employee told to him, “*Why do you come to this division? ... It will be shut.*” (Nakashima 2003: 27).

First the task of purification of metal gallium (Ga) was ordered to Nakamura. This is the raw material for gallium phosphide (GaP) which is the material used for the yellow-green light-emitting diode. Nichia sold it to major manufacturers such as Toshiba. After a few months, he was ordered to produce gallium phosphide. The phosphorus production caused the explosion in the productive process (Nakashima 2003)<sup>6</sup>. It happened once or twice in a week. At least it occurred once in a month. The room was just like a miniature of the gunpowder factory of Alfred Nobel (Akasaki 2013)<sup>7</sup>. Nakamura said, “*I was very lucky. If broken pieces entered my eyes during the explosion, I would be blind*” (Nakashima 2003: 28-29). Nakamura ordered an aluminium plate to hang from the ceiling to protect the body. The production continued for more than three further years. Despite the goods were sold a little, the business was not successful. But Ogawa complimented the efforts of Nakamura and increased the Development division by one member (Nakashima 2003). However, these experimental experiences lived after. A new invention needs new equipment. If large quantities could be made in the existing facility, it was not new. The production of new goods also required new equipment and specific techniques to make them. In a sense, new equipment and specific techniques are also creative (Shimura 2014)<sup>8</sup>.

Next Nakamura was ordered to make gallium arsenide (GaAs). This is the material for emitting diodes that emit red light and infrared light. This too raised the danger of an explosion. The condition was worse, arsenic is a deadly poison. It must absolutely not be inhaled even during the smallest blast. He had to always cover his mouth and nose with a mask. If an explosion occurred, he had to take refuge immediately into the next room. Though he produced the diode crystal by overlapping these difficult tasks, the sales of the goods were still limited. The reason was the chase after the large companies after all. When it made something of good quality, Nichia sent it to a big company to assess. During the assessment, other companies made similar goods or big companies made it by themselves immediately to sell. Nakamura went onto a challenge. Not the red and green diode, but he would have

<sup>5</sup> The Awa Dance Festival is held from the 12<sup>th</sup> to the 15<sup>th</sup> of August as part of Buddhism festival in Tokushima Prefecture. Awa Dance is the largest dance festival in Japan. The movement is famous for people dancing, walking and raising their arms and vibrating. It is attracting over 1.3 million tourists every year.

<sup>6</sup> Phosphate is used for explosives. To make crystals a high temperature is needed, e.g. the blue diode requires 1000 degrees. The possibility of an explosion is conceivable.

<sup>7</sup> Nobel lost his brother and five assistants in his factory. In general, explosion is a danger in chemistry experiments. Prof. Askasaki experienced the explosion in his laboratory in Kobe Kogyo and flaming up in his laboratory at the Nagoya University.

<sup>8</sup> A prominent institute in Chiba Prefecture bought expensive DNA analysers from the United States. The introducer boasted their qualities. But he did not know at all. Meanwhile, the United States had developed more advanced DNA analysers. None of the officers understood that just purchasing the technology rather than developing it would leave the institute lagging behind.

made an outstanding product of the blue light-emitting diode. The blue diode was an unexplored area for semiconductor researchers. If he could be successful in the development of the blue light-emitting diode of high brightness, his success would be praised largely and Nakamura's name could be engraved in the history of the world of physics. At the same time, the blue light-emitting diode could create a huge market. First, Nakamura consulted his boss who answered: "*even though large companies are not yet successful so far, you cannot succeed at all*", Nakamura was dismissed (Nakashima 2003: 34).

Facing the wall, Nakamura prepared himself to be dismissed, he went to see President Ogawa and said: "Please let me research the blue light-emitting diode. Please invest in me and let me use several hundred million yens (several million euros). And please also allow me to study abroad" (Nakashima 2003: 34). He appealed directly to Ogawa (Nakashima 2003)<sup>9</sup>. Ogawa had sparse words, "*Yes. Sure. Do it!*", he readily agreed with Nakamura. It was the moment of excitement. Ogawa had expectations in Nakamura. "*Nakamura can do it ... The blue-diode will be used much in the electronics industry of the world in the future and it will give new work to many people beyond imagination*" (The Mainichi Shimbun 2014b). He praised the disciple in the company newsletter. This decision led to the success of the mass production of the blue light-emitting diode. Nakamura went to study the cooling method at the University of Florida in the United States in 1988. In 1989, Nakamura returned home and built the two-flow method (MOCVD) with funds of about 300 million yens (about 2.1 million euros). He proceeded in earnest in his research. Initially, he was chasing after the group of Prof. Akasaki and Prof. Amano. However, he could catch up with them with the two-flow method. He could find how to make an enhanced positive semiconductor of crystal of gallium<sup>10</sup>. It needed only heat. Finally, he completed this process by adding a fluorescent layer mixed with indium between the positive semiconductor and the negative semiconductor. In 1994, it was a feat achieved within four years. Here we respect the decision of Ogawa as an entrepreneur and pay homage to his acumen. At the time, Ogawa was thinking to withdraw from the light-emitting diode business. In fact, Matsushita (Panasonic) withdrew. Therefore researcher Akasaki retired from Matsushita, he became professor at Nagoya University<sup>11</sup>. However, as mentioned above, Ogawa was longing for the light that he embraced during the war, and he had a strong challenge spirit for the things unknown.

It was the resonant vibration of mentor and disciple. We could say it was the realisation of mutual respect between Ogawa and Nakamura (Nakatomi 2012)<sup>12</sup>. A mentor, president

<sup>9</sup> It is impossible to appeal directly to the president in large companies. Nakamura recalled it after. In the case of small and medium-sized enterprises, the merit of being able to appeal directly to the president has been demonstrated.

<sup>10</sup> This is needed to control of the electric flow. The function is positive and negative semiconductors. It was easy to make negative semiconductors, but to make positive semiconductors was difficult. Prof. Amano succeeded in the effective method to radiate electrons. But this requires much time and electric power. Prof. Nakamura invented the method to heat the crystal of gallium instead of electric radiation.

<sup>11</sup> Then he picked up free of charge the equipment that he built by himself and used at Matsushita, Prof. Akasaki put it in his laboratory at the University of Nagoya.

<sup>12</sup> Once the author wrote the emotional encounter of physicists in the paper, "*A mutual respect Bohr and Heisenberg*". Werner Heisenberg met with Niels Bohr. After he was invited as a researcher in Bohr Institute in Denmark, he established the uncertainty principle. Bohr and Heisenberg made the foundation of modern physics quantum theory. Today it spreads to computers, mobile telephones and LED. Great encounters create the great inventions.

Ogawa, loved his disciple Nakamura as a researcher. Nakamura did not have talent in acquisition of profit, but he was striving without flinching to the risk of explosion without rest. Ogawa was moved by the strong belief and actions of Nakamura. Probably a philosophical intuition flashed in his spirit. The decision of Ogawa will continue to shine in the history of management philosophy as the case of mutual respect which culminated in a great invention.

## Conclusion

Entrepreneurship is a method of exploitation of human resources of a given economy: their knowledge, passion, and engagement in implementation of minor business ideas. Many variables may contribute to whether an entrepreneur will be successful in their business or not. One of them is the philosophy of entrepreneurship/management that they embrace. Frequently, it is the very philosophy that causes small entrepreneurial initiatives to be transformed into remarkable successes bringing about inventions important for the whole world.

An example of such an “effective philosophy” is the actions of a local Japanese entrepreneur Nobuo Ogawa consisting in an extraordinary approach to implementation of business ideas, especially with respect to his employees – the most valuable resource of any contemporary company.

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## Przedsiębiorczość organizacyjna. Filozofia zarządzania lokalną firmą w Japonii

### Streszczenie

Nobuo Ogawa, lokalny przedsiębiorca w Japonii, po drugiej wojnie światowej zaczął swą działalność w branży farmaceutycznej, następnie przekształcił ją w firmę Nichia Company. Dzisiaj Nichia jest uznaną na całym świecie firmą z produkcji niebieskiej diody elektroluminescencyjnej (LED). Przed jej opracowaniem dalekowzroczny Ogawa przyjął do pracy Shuji Nakamurę. Nakamura usilnie proponował Ogawie zainwestowanie w te badania dużej kwoty pieniędzy i umożliwienie mu studiowania w Stanach Zjednoczonych. Ogawa natychmiast to zaakceptował. Nakamura wyjechał za granicę, a po powrocie do domu zajął się badaniami nad niebieską diodą elektroluminescencyjną. Inwestycja ta zakończyła się powodzeniem w roku 1993. W ciągu zaledwie czterech lat Nakamura zakończył swe badania nad masową produkcją niebieskiej diody elektroluminescencyjnej. Dziś LED jest używana jako oświetlenie wszędzie na świecie, a niebieska dioda elektroluminescencyjna umożliwiła wiele innowacji w wielu użytecznych dziedzinach. Dzięki temu wynalazkowi Nichia stała się globalnym przedsiębiorstwem. W roku 2014 Nakamura otrzymał Nagrodę Nobla w dziedzinie fizyki.

Pragniemy Państwu przybliżyć sylwetki Ogawy i Nakamury oraz zakończony sukcesem proces tworzenia niebieskiej diody elektroluminescencyjnej.

**Słowa kluczowe:** Nobuo Ogawa, Shuji Nakamura, Nichia, przedsiębiorczość, niebieska dioda elektroluminescencyjna, wzajemny szacunek.

**Kody JEL:** L26

## Организационное предпринимательство. Управленческая философия местной компании в Японии

### Резюме

Нобуо Огава (Nobuo Ogawa), местный предприниматель в Японии, начинал с фармации как области деятельности после второй мировой войны, затем преобразовал ее в компанию под названием *Nichia Company*. Сегодня Nichia – известная в мире компания по производству синего светодиода. Прежде чем развить ее, проницательный Огава принял на работу Сюджи Накамуру (Shuji Nakamura). Накамура уговорил Огаву заинвестировать крупную сумму денег в его исследования и дать ему возможность обучаться в Соединенных Штатах. Огава сразу же согласился на это. Накамура выехал за границу, а после возвращения на родину он занялся изучением синего светодиода. Инвестиция принесла успех в 1993 г. Накамура в течение лишь четырех лет завершил исследования по массовому производству синего светодиода. Сегодня LED используется в качестве освещения повсюду в мире, а синий светодиод позволил на многочисленные инновации во многих областях применения. Благодаря

этому изобретению фирма *Nichia* стала глобальным предприятием. Накамура в 2014 г. был удостоен Нобелевской премии в области физики.

Мы хотим ближе познакомить Вас с Огавой и Накамурой и с успешным процессом изобретения синего светодиода.

**Ключевые слова:** Нобуо Огава (Nobuo Ogawa), Сюдзи Накамура (Shuji Nakamura), *Nichia*, предпринимательство, синий светодиод, взаимоуважение.

**Коды JEL:** L 26

Artykuł nadesłany do redakcji w kwietniu 2015 roku

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Afilijacje:

dr Marcin W. Staniewski

Wyższa Szkoła Finansów i Zarządzania w Warszawie

ul. Pawia 55

01-030 Warszawa

tel.: 22 624 41 42

e-mail: staniewski@vizja.pl

Kiyokazu Nakatomi

Chiba Prefectural Togane Commercial High School in Chiba

1641-1 Kugadai Matunogo

Togane City Chiba Prefecture

Japan 283-0806

e-mail: k-nakatomi@proof.ocn.ne.jp