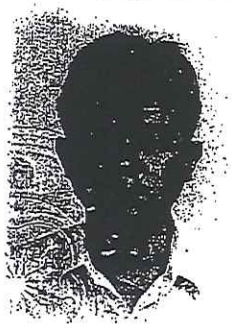
教授證書



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經本部依專科以上學校教師資格審定辦法審定合於教授資格　此證

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國立勤益科技大學 109 年推薦講座教授論文一覽表

被推薦人：陳坤盛教授

序號	論文題目	期刊名稱及 ISSN 碼	作者順序	發表日期	發表卷數、期數及頁碼	期刊等級	
1	Developing one-sided specification Six-Sigma fuzzy quality index and testing model to measure the process performance of fuzzy information	ISSN：0925-5273 期刊名稱：International Journal of Production Economics	第一作者	108 年 2 月	卷數:208 期數: 頁碼: 560-565	SCIE	√
2	Developing a fuzzy green supplier selection model using Six Sigma quality indices	ISSN：0925-5273 期刊名稱：International Journal of Production Economics	第一作者	108 年 6 月	卷數:212 期數: 頁碼:1-7	SCIE	√
3	Developing a multi-quality characteristic analysis model to measure the quality of quick-release bicycle hubs	ISSN：0253-3839 期刊名稱：Journal of the Chinese Institute of Engineers	通訊作者	108 年 05 月	卷數:42 期數:4 頁碼: 309-318	SCIE	√
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6	Renewable power output forecasting using least-squares support vector regression and google data	ISSN：2071-1050 期刊名稱：Sustainability	第一作者	108 年 6 月	卷數:11 期數:11 頁碼: 3009	SSCI	√

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Developing one-sided specification six-sigma fuzzy quality index and testing model to measure the process performance of fuzzy information

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Six sigma quality index
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ABSTRACT

Depending on the quality characteristic, a process capability index (PCI) can be used for one-sided specifications or for bilateral specifications. A number of researchers have investigated the statistical properties of one-sided specification indices and proposed methods for applications. The later introduction of the Six Sigma approach also assisted many firms in effectively enhancing their production capacities, reducing waste, and increasing effectiveness. Chen et al. (2017a) modified the PCI for one-sided specifications and proposed the Six Sigma Quality Index (SSQI), which coincidently equals the quality level and has a one-to-one relationship with yield. However, uncertainty in quality characteristic measurements is common in practice, which can lead to judgment errors in conventional process capability assessment methods. This study therefore developed an SSQI for one-sided specifications based on the fuzzy testing method created by Buckley (2005) and developed a Six Sigma fuzzy evaluation index and testing model. In addition to having a simpler calculation procedure, the model takes the process capability and Six Sigma quality level into consideration and can process the uncertainties in the data to make it more convenient for the industry to solve engineering issues. Finally, we presented a practical example to demonstrate the applications. The model proposed in this study can provide the industry with a practical approach to assess process quality in a fuzzy environment.

1. Introduction

Process capability indices (PCIs) are effective tools used to determine whether the process capability and performance of products reach requirements. Depending on the quality characteristic, a PCI can be either for one-sided specifications or for bilateral specifications. With PCIs, users can analyze and improve process and product quality, ensure that the process quality of the product remains over a certain level, and also prevent the production of defective products. The earliest PCIs used to evaluate quality characteristics with one-sided specifications, C_{pu} and C_{pl}, were proposed by Kane (1986). These two indices have one-to-one relationships with yield and can therefore fully reflect process yield: $Yield\% = \Phi(3C_{pu})$ and $Yield\% = \Phi(3C_{pl})$, where $C_{pu} = (USL - \mu_x)/3\sigma_x$ is a smaller-the-better (STB) index, $C_{pl} = (\mu_x - LSL)/3\sigma_x$ is a larger-the-better (LTB) index, μ_x and σ_x denote the process mean and standard deviation, respectively, and USL and LSL represent the upper and lower specification limits. A number of researchers have investigated the statistical properties of one-sided specification indices and proposed methods for applications, including Prasad and Bramorski (1998), Chou and Owen (1989), Chen et al. (2002), Pearn and Chen (2002), Chen et al. (2007), Hsu et al. (2016) and Chen et al. (2017b). These two indices are currently the PCIs most commonly used to evaluate quality characteristics with one-sided specifications and can be employed to assess the process capability performance of one-sided specifications in various industries.

The later introduction of the Six Sigma approach also assisted many firms in effectively enhancing their production capacities, reducing waste, and increasing effectiveness (Huang et al. (2010); Chen and Chen (2016); Chen et al. (2017a)). Like the PCIs, the Six Sigma quality levels have also become good quality control methods and communication tools in the industry. As a result, many researchers, such as Chen et al. (2009), Huang et al. (2010), Wang et al. (2011), Chen et al. (2012), Chen et al. (2017a), and Wang et al. (2017), have examined the relationships between PCIs and the Six Sigma and their applications so that both approaches can be easily used to solve engineering problems

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Developing a fuzzy green supplier selection model using six sigma quality indices

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ARTICLE INFO

Keywords:
Six sigma quality indices
Quality characteristics
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Fuzzy numbers

ABSTRACT

Under the impact of global warming, enterprises must grow, take care of the protection of the green environment and reduce the impact on society. Therefore, 4R (Reduce, Reuse, Recycle, Recovery) is an important green concept. For sustainable production, improving product quality is one of the most crucial strategies, because enhancing product quality can reduce process scrap and the rate of Reduce, increase product availability, prolong maintenance intervals, and increase the rate of Reuse for maintenance as well as the rate of Recycle for the reproduction of all components. Meanwhile, owing to the increase of the service life, the time of Recovery will be postponed. Taiwan's electronics industry has developed from semiconductor technology to peripheral electronic components with a complete industrial ecosystem and a highly specialized division of labor. In the entire specialized and cooperative industrial chain, suppliers must be carefully selected to ensure the quality of each component and the final product quality. To sum up, this paper can fully reflect the six sigma indicators of the process yields and quality levels to construct a complete green supplier fuzzy selection model. The fuzzy evaluation model developed in this paper analyzes whether the method of collecting the required data is consistent with the traditional method of collecting data, which can increase the practical convenience. Besides, regardless of the sample sizes, more accurate judgments can be made to select suppliers, assisting the businesses and all suppliers to improve process quality (technical upgrades) and performance and thereby increasing 4R benefits as well as moving towards the goal of industry sustainability.

1. Introduction

Since 1980, the electronics industry in Taiwan has been progressing from semiconductor technology to PC assembly and the standardization of peripheral components. This development represents a complete ecological chain. There have also been substantial advancements in Original Equipment Manufacturer (OEM)/Original Design Manufacturer (ODM) research, development, and manufacturing. According to the latest report of Trend Force's Tuoba Industrial Research Institute, Taiwanese firms account for approximately 70% of the world's foundries, 50% of the world's semiconductor packaging and testing services, 40% of the world's touch panels, and nearly 30% of LCD panels and light-emitting diodes (LEDs). Taiwanese manufacturers conduct extensive research and development, and supply the components and OEM for products for every type of high-tech device. All of the components required for these products must be sourced, purchased, and then assembled. Increasingly competitive global markets are cutting into profits, thereby necessitating reductions in scrap and rework by implementing improvements in the quality of parts and assembly.

The 4R principle (i.e., recycle, reduce, reuse, and replace) has been promulgated by a wide range of researchers, including Tang et al. (2004), Grubbström and Tang (2006), Zanoni et al. (2012), Chen et al. (2014), Wei et al. (2015a,b). Reproduction refers to the disassembly and reprocessing of old products and their reassembly as new ones. Reproduction reduces the cost of materials; however, it often requires considerable manpower. Improving the quality of components and assembly can reduce the amount of scrap and rework, thereby increasing product availability and extending the service lifetime. This means that any company seeking to produce a high-quality product at low cost must find a good supplier, i.e., a supplier capable of ensuring components of good quality.

Grossman and Helpman (2002) identified supplier outsourcing strategies as an element crucial to market competitiveness and flexibility in business operations. The selection of a supplier is generally based on sales performance. Chen et al. (2005) and Chen and Chen (2006) reported that the current competitive environment is essentially a competition among

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Developing a multi-quality characteristic analysis model to measure the quality of quick-release bicycle hubs

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ABSTRACT

To reduce the pollution caused by the carbon emissions of automobiles and locomotive vehicles, many countries around the world have encouraged citizens to use bicycles for short-distance trips in recent years. Bicycles are comprised of many parts, and quick-release hubs are highly important for the fixtures on the front and rear wheel axles of a bicycle. The quick-release hub is a multi-quality characteristic product, including two larger-the-better quality characteristics (quick-release stroke and tensile strength) and three nominal-the-best quality characteristics (axis size, assembly distance, and the outer diameter of the spindle). To improve the quality of quick-release hubs, this study proposes a multi-quality characteristic analysis table (MQCAT) and a multi-quality characteristic analysis model (MQCAM). The proposed method can provide a valuable reference by which to guide efforts aimed at improvement for quick-release hub manufacturers. A quick-release hub manufacturer in central Taiwan is presented to illustrate the feasibility of the proposed method. In addition, a comparison with recent methods is provided to demonstrate the advantages of the proposed method. Finally, conclusions are made based on the research study findings.

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KEYWORDS
Quick-release hub; multi-quality characteristic; six sigma quality index; confidence interval; process capability index

1. Introduction

The advancements in science and technology have led to serious environmental impacts, including global warming, the imbalance between the supply and demand of energy, and uncontrollable climate change (Friedman 2008). To address the above problems, many countries around the world have encouraged citizens to use bicycles for short-distance trips, thereby reducing the effects of carbon emissions from automobiles and other vehicles on the environment. For instance, Taiwan has invested approximately USD 7 million in planning and establishing the bicycle lane system since 2002 (Chang and Chang 2003); Holland has spent about USD 28 billion on implementing a national subsidy bill for bicycle lanes (Rietveld and Daniel 2004); 28 countries have implemented 461 bicycle-sharing plans (Zhang et al. 2015).

As bicycles feature diverse functions and materials and the overall structures of bicycles consist of many parts and components (Wilson 2004), it is difficult for bicycle manufacturers to monitor and manage production quality. The quick-release hub (see Figure 1) is a special fixture part on the axles of the front and rear wheels. In general, a quick-release hub is a metal pole of about 100–150 mm, with screw thread, an exclusive supporting nut on one end, and a small handle on the other. The functional principle of a quick-release hub is as follows: there is a cam on the surface of the handle, and the cam and the handle interact. If the handle is switched off, the cam will promote the handle. In this way, the distance between the handle and the nut on the other end of the quick-release pole will narrow (enlarge), and the quick-release hub can be fastened (loosened). Therefore, a quick-release hub user can easily disassemble the wheels by simply releasing the quick-release axis; then, the bicycle wheel can be cleaned, maintained, and taken along without any supporting tools. While a quick-release hub is a highly convenient tool that is easy to use, if a poor quality, oversized, or undersized quick-release hub is installed on a bicycle, the wheel will wobble and the quick-assembly pole will break, thereby causing danger to the bicycle rider. Hence, quick-release hub manufacturers need an effective method to improve the quality of their products to provide customers with stable, safe, and reliable quick-release hubs.

To create high-quality products, quick-release hub manufacturers can adopt the Six Sigma method to improve and manage production quality. The term Six Sigma was first coined by Motorola in 1987 as a response to the need to improve quality and reduce defects in their products/processes (Chen and Yang 2018). The target failure rate for Six Sigma projects would not make more than 3.4 defective parts per million (PPM) opportunities produced when the process mean μ may shift 1.5σ to the left or right of the target value (Montgomery and Woodall 2008). Table 1 shows the relationships among quality level, quality yield and defect rate (PPM) with a 1.5σ shift. According to Wyper and Harrison (2000), the profit increase within five years from the implementation of the Six Sigma method by Motorola was about USD 2.2 billion. Later, many companies such as GE, TI, HP, Dell, and Ford made great efforts to promote

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Two-tailed Buckley fuzzy testing for operating performance index

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Operating performance index (OPI)
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ABSTRACT

This paper proposes an operating performance index (OPI) based directly on the Six Sigma process quality index. We considered the following case: the number of customers arriving at a store follows a Poisson process of rate λ and the sequence of inter-arrival times is an exponential random variable with mean τ, where $\tau = 1/\lambda$. In operating performance assessments, using the statistical testing to evaluate the OPI can lower the risk of misjudgment caused by sampling error. A smaller sample size entails a larger sampling error, while a larger sample size entails a smaller sampling error. Thus, using critical value for statistical testing can result in inconsistencies for different sample size. We therefore referred to the one-tailed fuzzy method proposed by Buckley (2005) for the parameters of population distributions and developed a two-tailed fuzzy test for the OPI to assess operating performance. The advantage of this approach is that conventional measurement methods can be used during data collection, and then the confidence interval of the OPI can be used to construct a fuzzy membership function for fuzzy testing. This not only lowers the risk of misjudgment caused by sampling error, but also enhances testing accuracy.

1. Introduction

The Six Sigma quality approach proposed by Motorola in 1986 is an effective tool that helps firms enhance quality, lower costs, and increase profits, as well as improve process quality and performance [1–3]. Chen et al. [4] emphasized that process capability indices are widely used in the industry to assess, analyze, and improve process quality and serve as an effective tool for communication among internal engineers, sales personnel, and customers. Other statisticians and quality engineers such as Chen et al. [5], Huang et al. [6], and Wang et al. [7] have examined the relationships between process capability indices and Six Sigma quality levels. Chen et al. [8] referred to the above studies to propose the Six Sigma process quality indices.

These Six Sigma process quality indices have also been applied to non-manufacturing industries. For instance, Lin et al. [9,10] developed performance evaluation indices for physical fitness based on similar concepts, and Chen and Yang [11] directly used the smaller-the-better index to assess performance in the service industry. Chen and Yang [11] focused on the following case: the number of customers arriving at a store follows Poisson distribution of rate λ and the

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Development and application of performance improvement verification model: a case study of an e-learning system

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Many researchers have employed fuzzy linguistic scales to measure customer fuzzy perceptions and increase the reliability of their research. However, complex response methods may affect the precision of responses and the willingness of respondents. Thus, based on the concepts of distance and probability, we propose a simple response method for fuzzy linguistic scales to address these issues. In addition to a performance evaluation matrix to quickly identify items in need of improvement, we included order statistics and nonparametric statistics in a performance improvement verification model that solves the problems posed by sample size differences in pre- and post-improvement. This model is also applicable when the population does not follow a normal distribution. Finally, we used a case study with a CALL system to demonstrate the application of the proposed model, which fulfils the spirit of continuing improvement in total quality management.

Keywords: performance evaluation matrix; order statistics; performance improvement verification model; CALL system

1. Introduction

The objective of this study was to develop a performance improvement verification model and demonstrate its effectiveness through application to a case study of an e-learning system. This section presents the background, motives, and objectives of this study as well as the structure of the paper.

We first explain the research background. Lambert and Sharma (1990) were the first to construct a performance evaluation matrix (PEM) by collecting the voice of customers (VOC) regarding satisfaction and importance. This approach has since been widely applied to evaluate and improve performance in various industries. For example, Hung, Huang, and Chen (2003) used the beta distribution to describe the satisfaction of customers and the factors to which they attribute importance. They further proposed satisfaction and importance indices with standardised meaning, thereby enhancing the convenience of PEM application and the effectiveness of performance management and monitoring. Since then, many researchers have replaced the importance index with the regression or correlation coefficients of overall satisfaction and individual satisfaction, which can reduce the amount of data required by 50%, increase the willingness of customers to fill out questionnaires, and decrease the probability of assessment errors. For instance, Chen, Chen, and Lin (2012) replaced importance with the coefficients of the multiple regression model of

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sustainability

MDPI

Article

Renewable Power Output Forecasting Using Least-Squares Support Vector Regression and Google Data

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Abstract: Sustainable and green technologies include renewable energy sources such as solar power, wind power, and hydroelectric power. Renewable power output forecasting is an essential contributor to energy technology and strategy analysis. This study attempts to develop a novel least-squares support vector regression with a Google (LSSVR-G) model to accurately forecast power output with renewable power, thermal power, and nuclear power outputs in Taiwan. This study integrates a Google application programming interface (API), least-squares support vector regression (LSSVR), and a genetic algorithm (GA) to develop a novel LSSVR-G model for accurately forecasting power output from various power outputs in Taiwan. Material price and the search volume via Google's search engine for keywords, which is used for various power outputs and is collected by Google APIs, are used as input data. The forecasting model uses LSSVR. Furthermore, the LSSVR employs a GA to find the optimal parameters for the LSSVR. Real-world annual power output datasets collected from Taiwan were used to demonstrate the forecasting performance of the model. The empirical results reveal that the proposed LSSVR-G model is superior to all other considered models both in terms of accuracy and stability, and, thus, can be a useful tool for renewable power forecasting. Moreover, the accuracy forecasting thermal power and nuclear power could effectively assist in understanding the future trend of renewable power output in Taiwan. The accurately forecasting result could effectively provide basic information for renewable power, thermal power, and nuclear power planning and policy making in Taiwan.

Keywords: renewable energy; least-squares support vector regression; social media

1. Introduction

Governments currently promote methods of electricity generation with high efficiency, minimal pollution, and greenhouse gas emissions in accordance with the United Nations' Sustainable Development Goals (SDGs). Sustainable and green technologies have been widely studied, including non-dispatched renewable energy sources such as solar power and wind power. However, thermal and nuclear power outputs still contribute a higher percentage toward industry and public requirements in Taiwan. Governments need to engage in long-term planning for electricity generation. Therefore,

applied sciences

MDPI

Article

Confidence Interval Based Fuzzy Evaluation Model for an Integrated-Circuit Packaging Molding Process

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Abstract: The electronics industry in Taiwan has achieved a complete information and communication technology chain with a firm position in the global electronics industry. The integrated-circuit (IC) packaging industry chain adopts a professional division of labor model, and each process (including wafer dicing, die bonding, wire bonding, molding, and other subsequent processes) must have enhanced process capabilities to ensure the quality of the final product. Increasing quality can also lower the chances of waste and rework, lengthen product lifespan, and reduce maintenance, which means fewer resources invested, less pollution and damage to the environment, and smaller social losses. This contributes to the creation of a green process. This paper developed a complete quality evaluation model for the IC packaging molding process from the perspective of a green economy. The Six Sigma quality index (SSQI), which can fully reflect process yield and quality levels, is selected as a primary evaluation tool in this study. Since this index contains unknown parameters, a confidence interval based fuzzy evaluation model is proposed to increase estimation accuracy and overcome the issue of uncertainties in measurement data. Finally, a numerical example is given to illustrate the applicability and effectiveness of the proposed method.

Keywords: integrated-circuit packaging; Six Sigma quality index; confidence interval based fuzzy evaluation model; α-cuts; membership function; fuzzy number

1. Introduction

Integrated-circuit (IC) packaging is a procedure in which a processed wafer is cut into dies and then coated in materials such as resin, ceramics, and metal. The small volume of ICs means that electronic components are very close together, but this allows circuits to work faster and more reliably and protects the crystallites from external contamination. Thus, ICs are fundamental components of electronic products [1]. The cluster effect in the electronics industry in Taiwan has resulted in a complete information and communication technology industry chain with a firm position in the global electronics industry [2–4]. At present, the output values of Taiwan's wafer foundry industry and IC packaging and testing industry take up the largest shares of the global market (approximately 70% and 50%, respectively). Companies in Taiwan also provide vertically integrated services including design, research and development (R&D), component supply, assembly, and original equipment manufacturer (OEM) manufacturing, such as MediaTek's IC design services, Taiwan Semiconductor Manufacturing Company (TSMC)'s wafer foundry services, and Foxconn's assembly and production services [5]. During the production process, the quality of all components and the assembly must be ensured so as to provide consumers with safe products of good quality and performance. For this, process capability indices (PCIs) are useful and convenient tools used to determine whether the process

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Quality Capability Assessment for Thin-Film Chip Resistor

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ABSTRACT Chip resistors are a type of resistor among passive components; they are mainly used to regulate the voltage and current in electronic products. A single electronic product may be embedded with dozens of or even more than a thousand thin-film chip resistors varying in resistance. Thin-film chip resistors have low temperature coefficients, which makes them stable and reliable. They have five primary nominal-the-best (NTB) quality characteristics: length, width, height, upper width, and lower width. To increase the quality of thin-film chip resistors and prevent losses from customers returning low-quality or defected products, this study proposes a quality capability assessment method. The proposed method takes sampling errors into account and includes acceptance criteria for individual quality characteristics and the total quality capability. If either of the criteria is not fulfilled, then the manufacturer must improve quality capabilities. A case study of a manufacturer in central Taiwan is presented to illustrate the feasibility of the proposed method. Finally, conclusions and recommendations for future work are presented.

INDEX TERMS Thin-film chip resistor, process capability index (PCI), quality capability analysis chart (QCAC), normal-the-best (NTB), lower confidence limit (LCL).

I. INTRODUCTION

Taiwan's electronic industry has unrivaled manufacturing capabilities. There are over 55 passive component manufacturers in Taiwan, among which Yageo is the top chip resistor manufacturer in the world. The output value of Taiwan's passive component industry is the second highest in the world. In 2017, the value of Taiwan's passive component exports reached USD 2.58 billion, 23.6% of which was from chip resistors. In 2018, the value of chip resistor exports reached USD 743 million, which was 30.47% more than that of the previous year [1]. Chip resistors are a type of resistor among passive components and are mainly used to lower the circuit voltage and limit the current in electronic products. They are essential components of the majority of high-tech electronic products. The chip resistors can be divided into thin-film chip resistors and thick-film chip resistors. The former offer better precision and lower temperature coefficients, which means more stable and reliable resistance.

Figure 1 displays the five primary nominal-the-best (NTB) quality characteristics of a thin-film chip resistor, namely, length (L), width (W), height (H), upper width (UW), and lower width (LW).

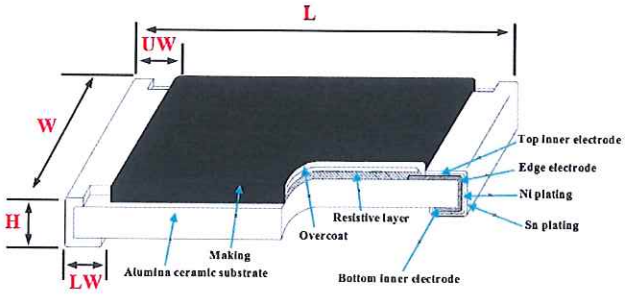

FIGURE 1. Quality characteristics of thin-film chip resistor.

Small in volume, thin-film chip resistors are mainly used in consumer electronics such as laptop computers, digital cameras, and mobile phones. They are also being used in emerging industries for the Internet of Things, wearable devices, and intelligent control. A single electronic product may be embedded with dozens of or even more than a thousand chip resistors varying in tolerance. Thus, installing a thin-film chip

The associate editor coordinating the review of this manuscript and approving it for publication was Fanbiao Li.

applied sciences

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Article

A Model for Evaluating the Performance of the Bearing Manufacturing Process

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Abstract: Reliability and product process quality are essential in meeting market demand and enhancing competitiveness in the machine tool industry. In addition, manufacturing time performance is also one of the important indices. Therefore, this paper focuses on process quality and manufacturing time and defines a manufacturing time performance index to feedback the acceptance rate of the manufacturing time. The process performance evaluation chart delineated the observations of variations in various workstations, and, hence, in controlling the stability of the work process. The Six Sigma quality indices are constructed by the process accuracy indices and precision indices are represented by *X*-axis and *Y*-axis respectively. The process quality evaluation chart evaluates the level of the process quality, as well as proposes the direction of improvement. The manufacturing time performance—*Z*-axis is used to assess whether the manufacturing time performance meets the requirements. The process performance evaluation chart constructed by this paper makes it easier for researchers to observe which workstations have a process variation in the process, to control the stability of the process effectively, to provide the improvement reference for staff on the scene and to enhance the competitiveness of the industry.

Keywords: quality characteristic; Six Sigma quality index; manufacturing time performance index; process performance evaluation chart

1. Introduction

The machine tool industry is the foundation of all manufacturing industries and mainly produces components for various types of machining platforms and processing equipment. Machine tools play a pivotal role in the development of the entire machine industry and thus are known as the "mother of all machines". The development of the machine tool industry in a country is strongly correlated with its economic system as machine tools are a major foundation for the nation's economic development and demonstrate national competitiveness. Numerous industries must rely on machine tools to achieve production value. Taiwan is the seventh-largest machine tool producer and fourth-largest machine tool exporter in the world. Japan and Germany have enacted policies to depreciate their currency, and China has experienced rapid and considerable technological development. Consequently, Taiwan's advantage in the export of machine tools has been declining. To satisfy market demands and improve the competitiveness of the industry, improving the quality and manufacturing process of machine tools and mitigating the effects of international competition are necessary steps to take.

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Testing process quality of wire bonding with multiple gold wires from viewpoint of producers

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Wire bonding involves welding multiple gold wires to connect integrated circuits (ICs) to external circuits for power and signal transmission. Poor-quality wire bonding can prevent the IC and the electronic product from functioning effectively. In view of this, we developed a model to assess and control the quality of wire bonding with multiple gold wires from the viewpoints of both process and producers. We first analysed the consistency of wire bonding process performance. The Six Sigma quality index was then used to directly assess the quality of the wire bonding process and thereby examine its relationship with process yield. Furthermore, we derived the upper confidence limit of index Q_{PLI} by statistical inference, and used it to develop a testing model to ensure rigorous quality assessment. A real-world application in an IC packaging factory located in the Taichung Science Park, Taiwan, demonstrates the effectiveness of the proposed method.

Keywords: Wire bonding; process quality; consistency analysis; Six Sigma quality index; hypothesis testing

1. Introduction

Integrated circuits (ICs) involve the use of microelectronics technologies to integrate numerous extremely small electronic components onto a silicon chip to form a miniature electronic circuit. The electronic components can be divided into active components (transistors and diodes) and passive components (resistors, capacitors, and inductors). The small size of ICs necessitates a high level of proximity of the electronic components to one another, which greatly shortens the distance of electron motions, increases the speed and reliability of circuit operations, reduces energy consumption, and enhances operating performance. For these reasons, ICs are indispensable components of electronic products.

In the face of international competition, enterprises must endeavour to increase their competitiveness and progress towards sustainable development. This includes adopting customer-oriented operating strategies and striving to produce high-value products that meet customer needs. As a result, electronic products are becoming more compact and lightweight while offering greater performance and more functions, which means that ICs require more electronic components and circuits to meet the diverse needs of customers. Furthermore, ICs must be linked to external power and have electronic circuits to convey the power and signals needed by all of the electronic components in order to ensure that the electronic product functions effectively.

The above shows that ICs are crucial components in modern electronic products. Electronic components and circuits must be protected against external or environmental factors during the IC production process to prevent physical or chemical damage (such as collision, scratches, moisture, and corrosion). The complete structure for ICs can be formed by the IC packaging processes. The packaging protects the IC and also provides routes for power transmission and heat dissipation so that the small circuits are interconnected and have better thermal conductivity. Clearly, an IC's performance is closely associated with the packaging process, the procedure of which is displayed in Figure 1. Depending on the way the IC is linked to the printed circuit board (PCB), pin through hole (PTH) technology or surface mount technology (SMT) may be used for the packaging. Figure 2 presents a dual-in-line package (DIP), which is a form of PTH packaging.

During IC packaging, wire bonding involves welding gold wires to the chip and the inner leads of the lead frame so that the IC is connected to the external circuit. This means that the gold wires are crucial media for power and signal transmission between the IC and the outside, thereby making wire bonding one of the most important processes in IC packaging. Poor-quality wire bonding can easily lead to poor connections or even disconnections between the gold wires and the chip or the lead frame, which in turn prevents the IC and the electronic product from functioning normally. According to Roy, Das, and

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Two-phase selection framework that considers production costs of suppliers and quality requirements of buyers

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Buyers are faced with selecting the optimal supplier, while suppliers are left to consider production costs. In this study, we developed a two-phase selection framework that allows buyers to evaluate the performance of suppliers while taking production costs into account for value maximisation. This scheme is a win-win solution capable of promoting long-term relationships between buyers and suppliers. Under the assumption of normality, the first phase involves constructing a new Six Sigma quality capability analysis chart (SSQCAC) which takes production costs into account. The objective is to evaluate all potential suppliers using the $100 \times (1-\alpha)\%$ upper confidence limit (UCL) of an integrated Six Sigma quality index (SSQI) Q_{PIh} when dealing with products with smaller-the-better (STB), larger-the-better (LTB), or nominal-the-best (NTB) quality characteristics. According to interval estimation theory, this method can have a significant impact on the consumption of resources; i.e. the production costs of the supplier can be decreased by reducing the production quality to below that required by the buyer. The proposed method also filters out unsuitable suppliers in order to simplify the decision problem and reduce computational demands and operational risks/costs without compromising the quality of the final product. In the second phase, a detailed analysis is conducted using Euclidean distance measure to select the optimal supplier from among the remaining candidates. We conducted a real-world case study to evaluate the efficacy of the proposed method. We also conducted comparisons with existing methods to demonstrate the advantages of the proposed method and its managerial implications. Suggestions for future study are also provided.

Keywords: supplier selection; Six Sigma quality index; process capability index; Euclidean distance

1. Introduction

Globalisation and the development of information technology are ramping up competition from lower-cost suppliers overseas (Viswanadham and Samvedi 2013; Su and Chen 2018). Maintaining one's competitive advantage in the global market requires the selection of the right suppliers and the production of high-quality products (Chen, Yang, and Chen 2015; Wetzstein et al. 2016; Zouadi, Yalaoui, and Reghioui 2018). Ghorabaee et al. (2017), Dupont et al. (2018), and Jain et al. (2018) reported that the evaluation and selection of suppliers is a key role of supply chain managers, due to the fact that the purchase of materials and services can eat up more than 50% of the total revenue (Weber, Current, and Benton 1991). Carr and Pearson (1999) and Benton (2013) stated that some companies spend more than 80% of their revenue on the purchase of materials and services from outside suppliers. Holweg, Reichhart, and Hong (2011) indicated that the cost of components accounts for 70% of the total costs in most companies. Ferreira and Borenstein (2012) reported that the cost of purchasing goods and services accounts for 50% to 60% of every dollar earned. Arabsheybani, Paydar, and Safaei (2018) expressed that an unsuitable supplier could increase the cost of goods by as much as 30%, thereby reducing revenue. The selection of good suppliers can reduce purchasing costs and improve competitiveness with benefits for buyers and suppliers alike (Omurca 2013; Wu, Liao, and Yang 2013; Banaeian et al. 2018).

There is a large body of literature on the supplier selection problem (see, e.g. Ho, Xu, and Dey 2010; Amindoust, Ahmed, and Saghafinia 2013; Matinrad, Roghanian, and Rasi 2013; Karsak and Dursun 2016; Ghorabaee et al. 2017; Govindan, Fattahi, and Keyvanshokooh 2017a). Most researchers claim that the selection of suppliers should be treated as a multi-objective problem, involving a trade-off between manufacturing performance and competitive priorities (e.g. cost, quality, delivery time, reliability, service, environmental impact, coordination requirements among supply chain members, and agility and flexibility). Multi-criteria decision making (MCDM) methods, such as data envelopment analysis (DEA)

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Production data analysis system using novel process capability indices-based circular economy

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China Medical University, Taichung, Taiwan
Chun-Min Yu
National Chin-Yi University of Technology, Taichung, Taiwan, and
Kuen-Suan Chen
National Chin-Yi University of Technology, Taichung, Taiwan and
Asia University, Taichung, Taiwan

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Abstract

Purpose – The purpose of this paper is to establish mechanisms for process improvement so that production efficiency and product quality can be expected, and create a sustainable development in terms of circular economy.

Design/methodology/approach – The authors obtain a critical value from statistical hypothesis testing, and thereby construct a process capability indices chart, which both lowers the chance of quality level misjudgment caused by sampling error and provides reference for the processes improvement in poor quality levels. The authors used the bottom bracket of bicycles as an example to demonstrate the model and methods proposed in this study.

Findings – This approach enables us to plot multiple quality characteristics, despite varying attributes and specifications, onto the same process capability analysis chart. And it therefore increases accuracy and precision to reduce rework and scrap rates (reduce), increase product availability, reduce maintenance frequency and increase reuse (reuse), increase the recycle rates of components (recycle) and lengthen service life, which will delay recovery time (recovery).

Originality/value – Parts manufacturers in the industry chain can upload their production data to the cloud platform. The quality control center of the bicycle manufacturer can utilized the production data analysis model to identify critical-to-quality characteristics. The platform also offers reference for improvement and adds the improvement achievements and experience to its knowledge management to provide the entire industry chain. Feedback is also given to the R&D department of the bicycle manufacturer as reference for more robust product designs, more reasonable tolerance designs, and selection criteria for better parts suppliers, thereby forming an intelligent manufacturing loop system.

Keywords Internet of Things (IoT), Intelligent manufacturing, I-cloud, Process capability indices, Production data analysis

Paper type Research paper

1. Introduction

Companies must take into account both their own growth and environmental protection; many studies have consequently been conducted on green energy and the concept of a circular economy (see Guo *et al.*, 2017; Li *et al.*, 2018; Lin *et al.*, 2016; Wang, 2016; Wang *et al.*, 2018; Wu *et al.*, 2010). Chen, Wang and Tan (2019) pointed out that sustainable production can be achieved by the enhancement of product quality, which has the added benefit of increasing product value and industry competitiveness. Increasing process quality lowers scrap and rework rates, lengthens product life span, and reduces product maintenance, which can in turn reduce environmental pollution. As technologies associated with the Internet of Things (IoT) have gradually matured, the measurement and collection of production data have continued to advance, enabling the collection of big production data. Effective data analysis and application can enhance manufacturing

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Article

Supplier Selection and Performance Evaluation for High-Voltage Power Film Capacitors in a Fuzzy Environment

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Abstract: Rapid advances in technology have shortened the upgrade and replacement cycles in industries such as electronics, household appliances, and communication technologies. Within these industries, high-voltage power film capacitors have become indispensable electrical components due to their good electrical performance and high reliability. The selection and evaluation of suppliers of these capacitors is therefore increasingly important. Suppliers play a crucial role in the electronics industry; the quality of their products determines the degree to which the quality of the final product can be guaranteed. Supplier quality also affects the ability of all the members in a supply chain to control costs. Evaluation by decision-makers is highly significant in the supplier selection process. However, when the opinions of multiple decision-makers are combined, issues such as cognitive differences, fuzzy linguistics, and uncertainty are common. This study presents a supplier performance index S_{PL} and derives the estimates of the index S_{PL} and its statistical properties. The proposed index is not only helpful for the accurate measurement of supplier performance; it can also reduce cognitive differences among evaluators in the decision-making process (that is, the sample variability associated with the Likert scale). Evaluation scores for each criterion for the linguistic labels are converted to triangular fuzzy numbers in order to reduce ambiguity. Subsequently, integrated crisp values are obtained by defuzzification in a fuzzy inference system. A real-world case study of the supplier selection of high-voltage power film capacitors is provided to illustrate the efficacy of the proposed method.

Keywords: high voltage power film capacitor; supplier selection; fuzzy theory; performance evaluation

1. Introduction

Rapid advances in technology have resulted in the flourishing of the electronics and information industries; as such, the market demand for capacitors increases daily. Capacitors are a type of passive component similar to batteries. They can store electrical currents temporarily as well as block direct currents, couple alternating currents, store energy, and serve as bypasses. There are numerous types of capacitors, each with a wide range of applications; for example, high-voltage power film capacitors are commonly utilized in aircraft, ocean-going vessels, and high-frequency communication products.

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TITLES
ISO: Int. J. Prod. Econ.
JCR Abbrev: INT J PROD ECON

LANGUAGES
English

CATEGORIES
ENGINEERING, INDUSTRIAL - SCIE
ENGINEERING, MANUFACTURING - SCIE
OPERATIONS RESEARCH & MANAGEMENT SCIENCE - SCIE

PUBLICATION FREQUENCY
12 issues/year

Current Year All years

The data in the two graphs below and in the Journal Impact Factor calculation panels represent citation activity in 2017 to items published in the journal in the prior two years. They detail the components of the Journal Impact Factor. Use the "All Years" tab to access key metrics and additional data for the current year and all prior years for this journal.

Journal Impact Factor Trend 2017

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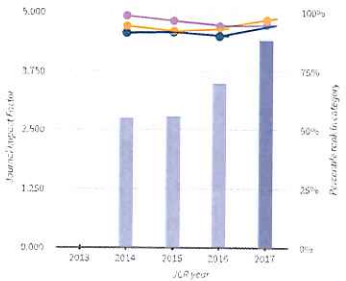
4.407
2017 Journal Impact Factor

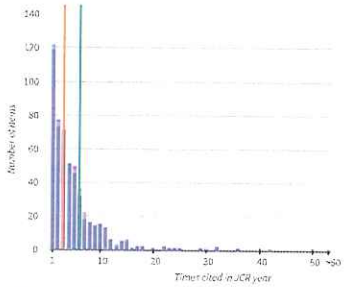


JIF — ENGINEERING
ENGINEERING, MULTIDISCIPLINARY
ENGINEERING, INDUSTRIAL
ENGINEERING, MANUFACTURING
OPERATIONS RESEARCH & MANAGEMENT SCIENCE

Citation distribution 2017

Printable Version

3 Article citation median 6 Review citation median



articles reviews other
article citation median review citation median

Journal Impact Factor Calculation

2017 Journal Impact Factor = 2,763 / 627 = 4.407

Journal Impact Factor contributing items

Show all

Citable items in 2016 and 2015 (627) Citations in 2017 (2,763)

TITLE	CITATIONS COUNTED TOWARDS JIF
How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study	63

How is Journal Impact Factor Calculated?

$$JIF = \frac{\text{Citations in 2017 to items published in 2015 (1882) + 2016 (881)}}{\text{Number of citable items in 2015 (360) + 2016 (267)}} = \frac{2,763}{627}$$

By: Wamba, Samuel Fosso; Akter, Shahriar; Edwards, Andrew; Chopin, Geoffrey; Gnanzou, Denis
Volume: 165 Page: 234-246 Accession number: WOS:000356110400023 Document Type:Review

Green supply chain management: A review and bibliometric analysis 42
By: Fahimnia, Behnam; Sarkis, Joseph; Davarzani, Hoda
Volume: 162 Page: 101-114 Accession number: WOS:000351965500009 Document Type:Review

Economic implications of 3D printing: Market structure models in light of additive manufacturing revisited 36
By: Weller, Christian; Kleer, Robin; Piller, Frank T.
Volume: 164 Page: 43-56 Accession number: WOS:000354141600005 Document Type:Article

Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain 32
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Volume: 160 Page: 120-132 Accession number: WOS:000348893500010 Document Type:Article

The value of Big Data in servitization 32
By: Opresnik, David; Taisch, Marco
Volume: 165 Page: 174-184 Accession number: WOS:000356110400018 Document Type:Article

Big data analytics in logistics and supply chain management: Certain investigations for research and applications 30
By: Wang, Gang; Gunasekaran, Angappa; Ngai, Eric W. T.; Papadopoulos, Thanos
Volume: 176 Page: 98-110 Accession number: WOS:000376701200010 Document Type:Review

A big data approach for logistics trajectory discovery from RFID-enabled production data 29
By: Zhong, Ray Y.; Huang, George Q.; Lan, Shulin; Dai, Q. Y.; Xu, Chen; et al.
Volume: 165 Page: 260-272 Accession number: WOS:000356110400025 Document Type:Article

An integrated green supplier selection approach with analytic network process and improved Grey relational analysis 25
By: Hashemi, Seyed Hamid; Karimi, Amir; Tavana, Madjid
Volume: 159 Page: 178-191 Accession number: WOS:000348890100017 Document Type:Article

Insights from hashtag #supplychain and Twitter Analytics: Considering Twitter and Twitter data for supply chain practice and research 24
By: Chae, Bongsug (Kevin)
Volume: 165 Page: 247-259 Accession number: WOS:000356110400024 Document Type:Article

Successful lean implementation: Organizational culture and soft lean practices 23
By: Bortolotti, Thomas; Boscari, Stefania; Danese, Pamela
Volume: 160 Page: 182-201 Accession number: WOS:000348893500015 Document Type:Article

Key Indicators 2017

IMPACT METRICS		INFLUENCE METRICS		SOURCE METRICS	
Total Cites	18,583	Eigenfactor Score	0.02300	Citable Items	296
Journal Impact Factor	4.407	Article Influence Score	0.972	% Articles in Citable Items	97.97
5 Year Impact Factor	4.976	Normalized Eigenfactor	2.63900	Average JIF Percentile	95.423
Immediacy Index	0.865			Cited Half-Life	6.4
Impact Factor Without Journal Self Cites	3.735			Citing Half-Life	9.1

Source data Box plot Rank Click here to view Rank, Cited Journal Data, Citing Journal Data, Box Plot, and Journal Relationships

Rank 2017

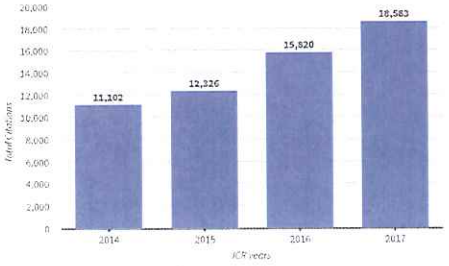
JCR Impact Factor

JCR Year	ENGINEERING			ENGINEERING, INDUSTRIAL			ENGINEERING, MANUFACTUF		
	Rank	Quartile	JIF Percentile	Rank	Quartile	JIF Percentile	Rank	Quartile	JIF Perc
2017	n/a	n/a	n/a	3/47	Q1	94.681	3/46	Q1	
2016	n/a	n/a	n/a	3/44	Q1	94.318	5/44	Q1	
2015	n/a	n/a	n/a	2/44	Q1	96.591	4/42	Q1	
2014	n/a	n/a	n/a	1/43	Q1	98.837	4/40	Q1	

ESI Total Citations 2017

Rank

JCR Year	ENGINEERING
2017	50/667-Q1
2016	53/661-Q1
2015	51/650-Q1
2014	50/628-Q1



These data summarize the characteristics of the journal's published content for the most recent three years, that is, 2017 and the two prior years, combined. This information is based on all listed authors and addresses. It is meant to be descriptive rather than comparative.

Contributions by country/region

country	count
1. USA	271
2. CHINA MAINLAND	255
3. England	129
4. Canada	68
5. GERMANY (FED REP GER)	67
6. France	64
7. Italy	57
8. Australia	42
- India	42
10. Netherlands	41

Contributions by organizations

organization	count
1. HONG KONG POLYTECHNIC UNIVERSITY	51
2. CARDIFF UNIVERSITY	20
3. CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)	18
- UNIVERSITY OF PADUA	18
5. UNIVERSITY OF MASSACHUSETTS SYSTEM	17
- DARMSTADT UNIVERSITY OF TECHNOLOGY	17
7. SOUTH CHINA UNIVERSITY OF TECHNOLOGY	16
- UNIVERSITY OF GRONINGEN	16
9. PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION (PCSHE)	14
- INDIAN INSTITUTE OF TECHNOLOGY (IIT)	14
- UNIVERSITY OF TENNESSEE SYSTEM	14
- UNIVERSITY OF NOTTINGHAM	14

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CATEGORIES
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PUBLICATION FREQUENCY
24 issues/year

Current Year 2017 All Years

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Journal Impact Factor Trend 2018

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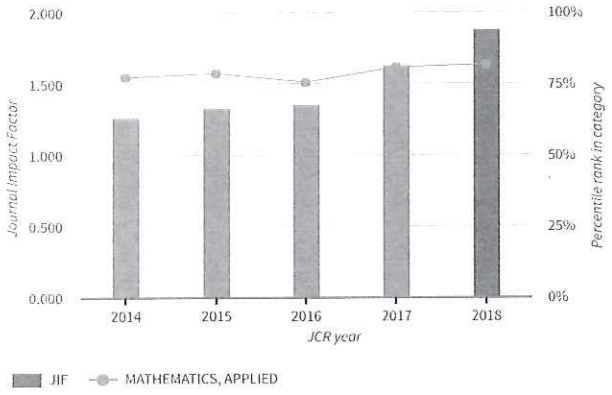
1.883
2018 Journal Impact Factor



Citation distribution 2018

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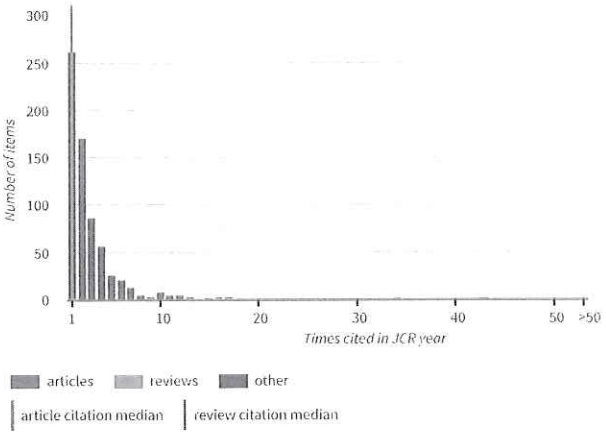
1
Article citation median

0
Review citation median



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JCR Abbrev: TOTAL QUAL MANAG BUS

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LANGUAGES
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14 issues/year

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Sustainability

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CATEGORIES
GREEN & SUSTAINABLE SCIENCE & TECHNOLOGY - SCIE

ENVIRONMENTAL SCIENCES - SCIE

LANGUAGES
English

PUBLICATION FREQUENCY
12 issues/year

Open Access from 2009

No. 7, 9, 13.

Applied Sciences-Basel

ISSN: 2076-3417
eISSN: 2076-3417
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CHEMISTRY, MULTIDISCIPLINARY - SCIE

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English

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6 issues/year

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IEEE Access

ISSN: 2169-3536
eISSN: 2169-3536
IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC
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1 issue/year

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INTERNATIONAL JOURNAL OF PRODUCTION RESEARCH

ISSN: 0020-7543
eISSN: 1366-588X
TAYLOR & FRANCIS LTD
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TITLES
ISO: Int. J. Prod. Res.
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ENGINEERING, INDUSTRIAL - SCIE

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24 issues/year

12

INDUSTRIAL MANAGEMENT & DATA SYSTEMS

ISSN: 0263-5577
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CATEGORIES
COMPUTER SCIENCE, INTERDISCIPLINARY APPLICATIONS - SCIE

ENGINEERING, INDUSTRIAL - SCIE

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English

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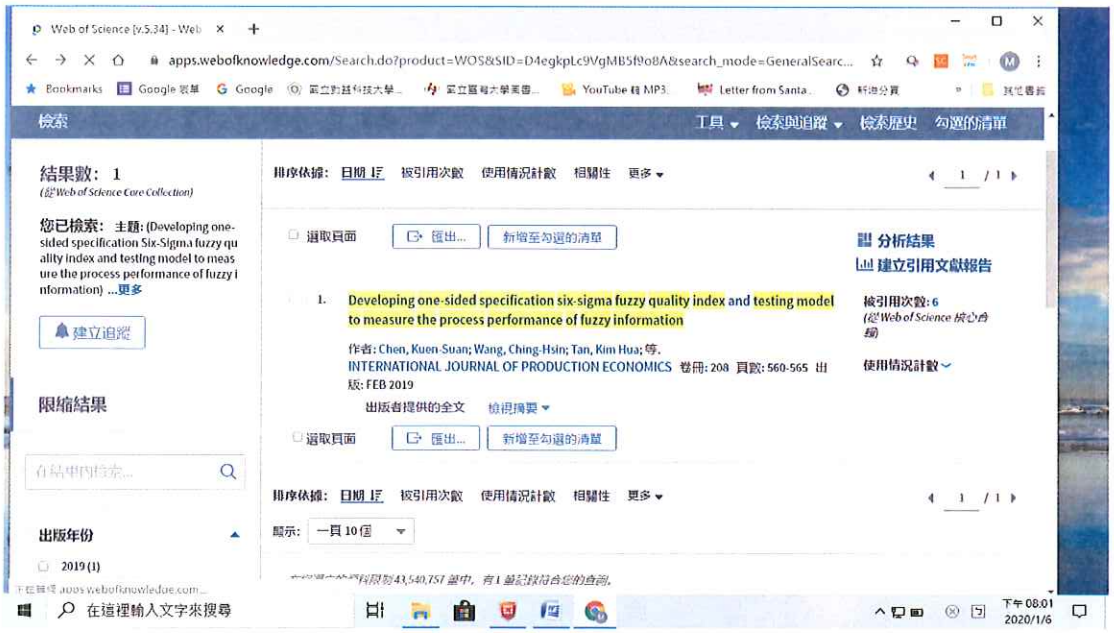
9 issues/year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作者: Chen, Kuen-Suan; Wang, Ching-Hsin; Tan, Kim Hua; 等.
INTERNATIONAL JOURNAL OF PRODUCTION ECONOMICS 卷冊: 208 頁數: 560-565 出版: FEB 2019
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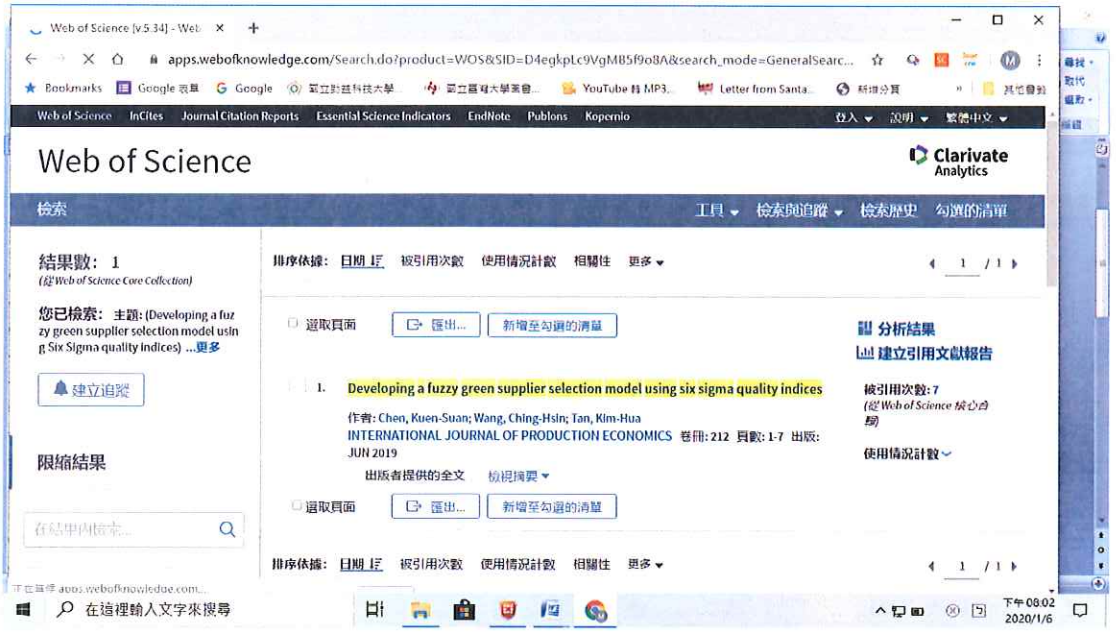
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作者: Yang, Chun-Ming; Chen, Kuen-Suan; Hsu, Chang-Hsien
JOURNAL OF THE CHINESE INSTITUTE OF ENGINEERS 卷冊: 42 期: 4 頁數: 309-318
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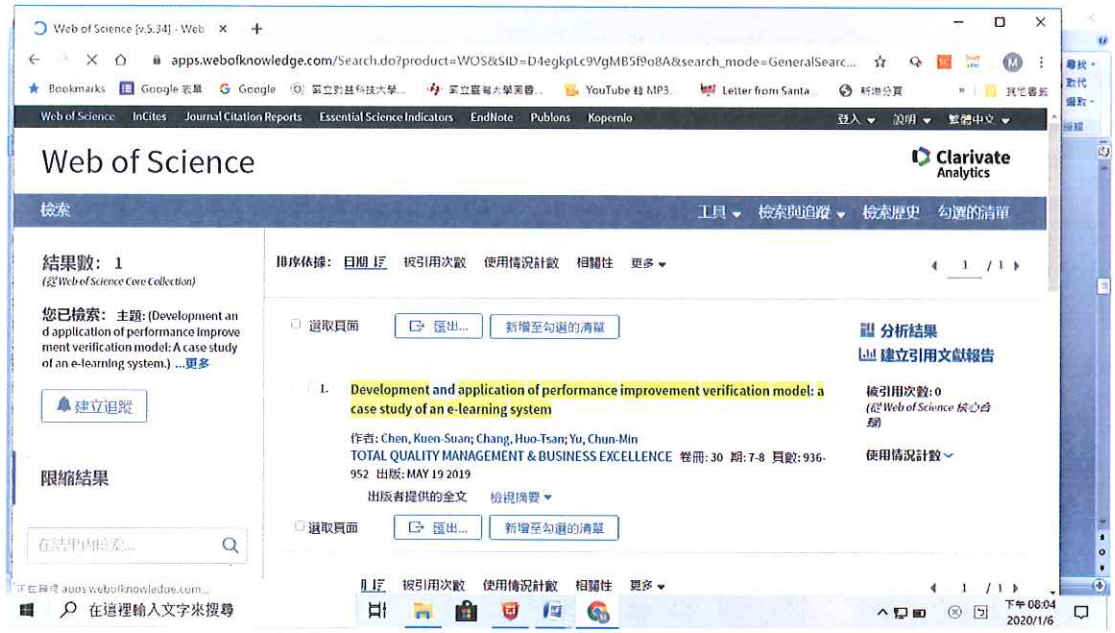
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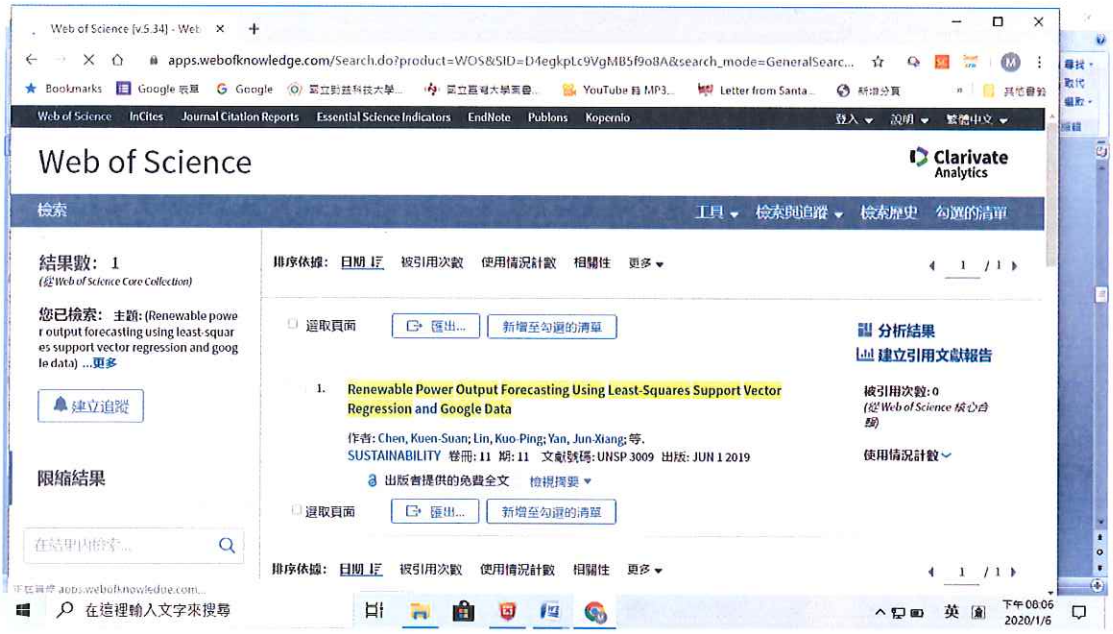
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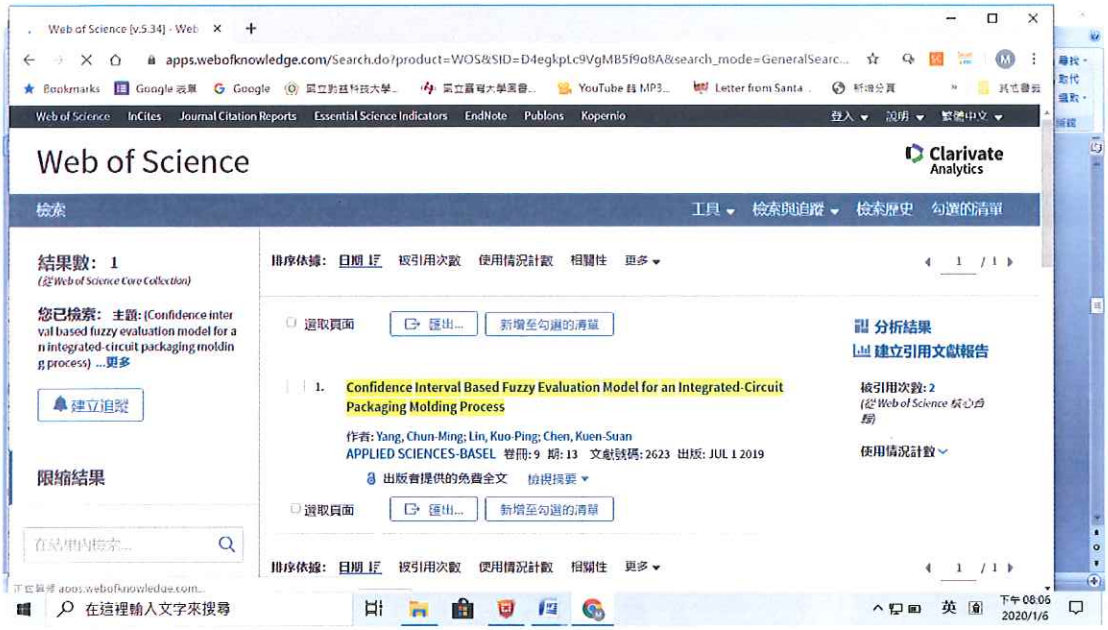
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作者: Yang, Chun-Ming; Lin, Kuo-Ping; Chen, Kuen-Suan
APPLIED SCIENCES-BASEL 卷冊: 9 期: 13 文獻號碼: 2623 出版: JUL 1 2019
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1. Quality Capability Assessment for Thin-Film Chip Resistor
作者: Chen, Kuen-Suan; Yang, Chun-Ming
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A Model for Evaluating the Performance of the Bearing Manufacturing Process
作者: Chen, KS (Chen, Kuen-Suan)[1,2]; Yu, CM (Yu, Chun-Min)[3]; Hsu, TH (Hsu, Ting-Hsin)[4]; Cai, SR (Cai, Shang-Ru)[1]; Chiou, KC (Chiou, Kuo-Ching)[5]
APPLIED SCIENCES-BASEL
卷冊: 9 期: 15
文獻號碼: 3105
DOI: 10.3390/app9153105
出版: AUG 1 2019
文件類型: Article
檢視期刊影響力
摘要
Reliability and product process quality are essential in meeting market demand and enhancing competitiveness in the machine tool industry. In addition, manufacturing time performance is also one of the important indices. Therefore, this paper focuses on process quality and manufacturing time and defines a manufacturing time performance index to feedback the acceptance rate of the manufacturing time. The process performance evaluation chart delineated the observations of variations in various workstations,
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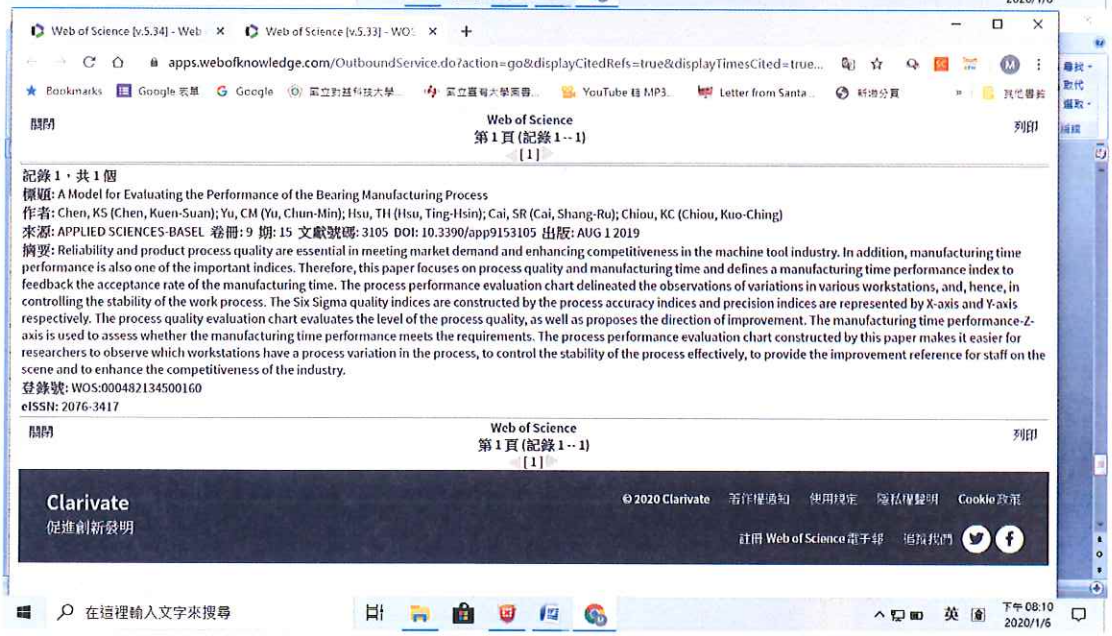
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作者: Chen, KS (Chen, Kuen-Suan); Yu, CM (Yu, Chun-Min); Hsu, TH (Hsu, Ting-Hsin); Cai, SR (Cai, Shang-Ru); Chiou, KC (Chiou, Kuo-Ching)
來源: APPLIED SCIENCES-BASEL 卷冊: 9 期: 15 文獻號碼: 3105 DOI: 10.3390/app9153105 出版: AUG 1 2019
摘要: Reliability and product process quality are essential in meeting market demand and enhancing competitiveness in the machine tool industry. In addition, manufacturing time performance is also one of the important indices. Therefore, this paper focuses on process quality and manufacturing time and defines a manufacturing time performance index to feedback the acceptance rate of the manufacturing time. The process performance evaluation chart delineated the observations of variations in various workstations, and, hence, in controlling the stability of the work process. The Six Sigma quality indices are constructed by the process accuracy indices and precision indices are represented by X-axis and Y-axis respectively. The process quality evaluation chart evaluates the level of the process quality, as well as proposes the direction of improvement. The manufacturing time performance-Z-axis is used to assess whether the manufacturing time performance meets the requirements. The process performance evaluation chart constructed by this paper makes it easier for researchers to observe which workstations have a process variation in the process, to control the stability of the process effectively, to provide the improvement reference for staff on the scene and to enhance the competitiveness of the industry.
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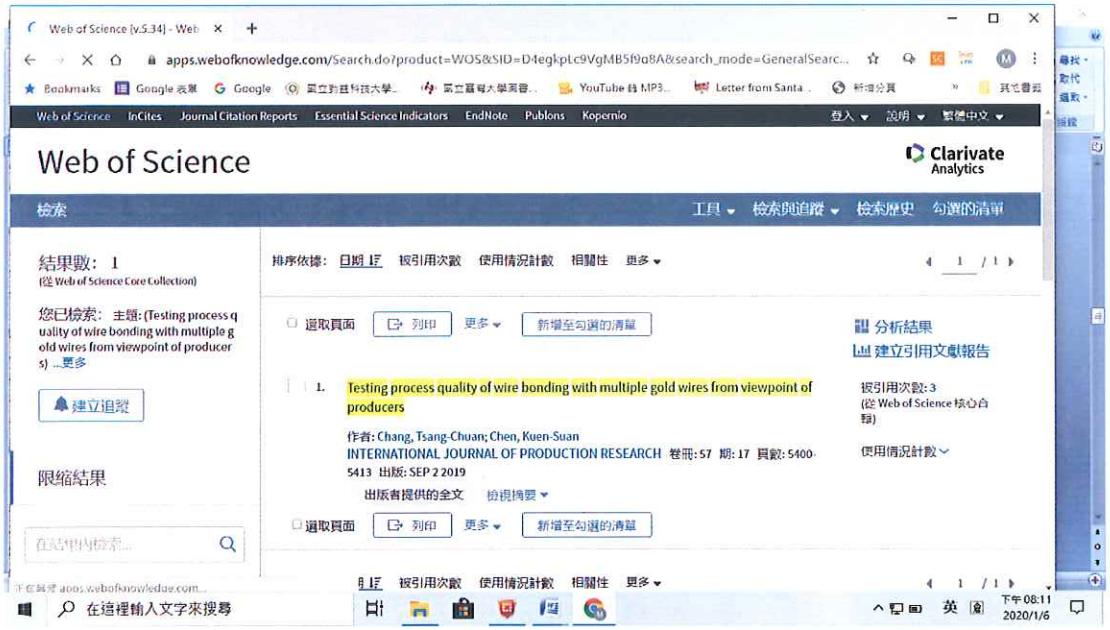
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1. Testing process quality of wire bonding with multiple gold wires from viewpoint of producers
作者: Chang, Tsang-Chuan; Chen, Kuen-Suan
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1. Two-phase selection framework that considers production costs of suppliers and quality requirements of buyers
作者: Yang, Chun-Ming; Chen, Kuen-Suan
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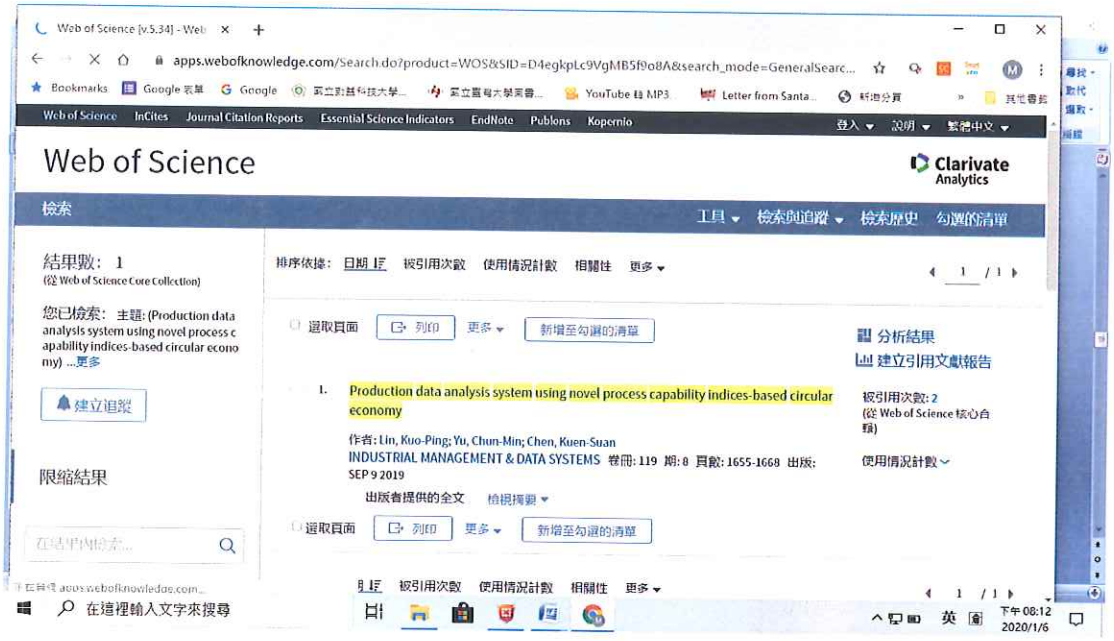
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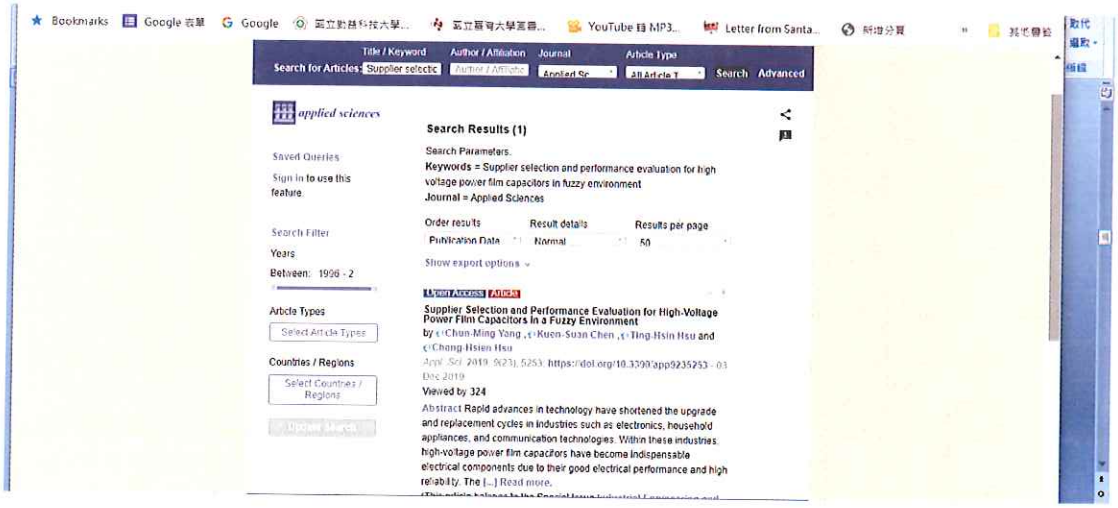
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by Chun-Ming Yang, Kuen-Suan Chen, Ting-Hsin Hsu and Chang-Hsien Hsu
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Abstract Rapid advances in technology have shortened the upgrade and replacement cycles in industries such as electronics, household appliances, and communication technologies. Within these industries, high-voltage power film capacitors have become indispensable electrical components due to their good electrical performance and high reliability. The [...] Read more.