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An understanding of the sustainability of business innovation

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Abstract

In a highly competitive environment, companies must not only initiate innovation but also must continue to innovate to maintain competitiveness. Rapid advances in both established and emerging technologies continue to bring new challenges to companies and so updating and tracking how companies sustain innovation is very important.

The purpose of this study is to understand, measure, and maintain the sustainability of business innovation. The core of this research explores: (1) how to measure business innovation, (2) what companies need to pay attention in order to sustain innovation, and (3) how to identify factors that have not been mentioned in previous studies.

In summary, this study is divided into three phases. Phase 1 seeks to show how to measure business innovations and investigate the relevant literature. This studt then sorts and analyzes the factors that affect the success of innovations, examine the criteria that have been used in innovation competition between nations, and summarize those factors based on the following categories: Business Culture and Management, Market-Oriented Products and Services, Well-Managed Customer Relationships, Information Technology, Clear Direction of Innovation Strategies, Human Resources Management, and Company Process Management. Phase 2 seeks to provide understanding of how firms can sustain innovation over years time and how companies that have won national awards are faring four years later. The study also compares the industry it belongs to in terms of revenue performance during the period 2009–2012 and chooses poor-performing companies as selected case samples. The result shows that if financial performance is sustained above the industry section in the first and second year, it usually remains above average in the third year. Phase 3 provide understanding of the factors affecting the innovation sustainability, through deep interviews, the result shows that Well-Managed Customer Relationship and Clear Direction of Innovation Strategies are most likely have a great impact of innovation sustainability, besides, the result found a potential factor - Knowledge Management.

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Chapter 1: Introduction

Under the intense competition and advancement of emerging technologies, businesses are forced to continuously innovate in all aspects in order to sustain a competitive position in today's service economy. Innovations in services have led to the greatest level of growth and dynamism over the past several years in terms of economic activity (de Brentani, 2001). Without innovation, an enterprise's future survival may be uncertain (Boessenkool, 2009). In the meantime, new technologies are constantly emerging and reforming old practices. These new technologies have a great impact on clients and have changed certain customer behaviors. Technologies such as SoLoMo, Internet of things, Cloud computing, and 3D printing have all affected frontline services and back-office operations. The adoption of these technologies for innovation involves dynamic capability in developing various extended applications. For example, RFID in supply chain management requires capabilities in redesigning processes and restructuring the inventory management; another example is social media application, which requires new ways of analyzing and interpreting customer behavior in order to create new approaches to acquire and retain customers. These new technologies have not only changed the behavior of many users, but have also brought new challenges to enterprises both in technical and business aspects. Shang and Hsu (2009) have examined business capabilities within service innovation and identified a few indicators including: a positive business culture, successful management philosophy, product/service innovation capabilities, effective incentive structure, impact of the external environment, etc. However, with the progress of emerging technologies, businesses require new capabilities in managing and sustaining innovations and may have new criteria in managing innovative success.

In addition to innovation, sustainability is of utmost importance for any enterprise to succeed. As tracked by the Boston Consulting Group (2012), enterprises such as Apple, Google, Facebook, and Amazon have maintained innovation in running their businesses with a continuous flow of new offerings, while others such as Netscape (v3.co.uk, 2009), BenQ (BusinessWeek, 2006), and Acer (CommonWealth, 2013) were unable to sustain their innovations and lost their competitiveness. It is intriguing to follow up on the performance of companies with a record of being innovative to learn factors that contribute to the ability to sustain innovative capabilities.

In this regard, there are three questions to be addressed regarding innovation management and sustainability: (1) How can we measure business innovation? (2) Can innovative organizations sustain their innovations? (3) What are the factors that affect the sustainability of an innovative service or product?

Chapter 2: Literature Review

2.1 Factors Reflecting Business-Innovation Capability

This chapter starts with reviewing factors that reflect business-innovation capability. The table below lists factors that have been covered in the extant literatures:

Table 1: Factors Reflecting Business Innovation

Factor Category	Factors Mentioned in Literature
Business Philosophy and Management	(Cooper, 2003) (Ottenbache et al, 2006) (Oke, 2007) (Yao-Shen, 2007) (Agarwal, & Selen, 2009).
Market-Oriented Products and Services	(de Brentani's, 2001) (Gassmann, 2006; Von Hippel, 2005).
Well-Managed Customer Relationships	(Cooper, 2003) (Heiskanen et al., 2004) (Oke, 2007) (Gremyr, Löfberg, & Witell, 2010) (Alam, 2013)
Successful Capabilities of Integration Internal Systems	(de Brentani's, 2001) (Hipp and Grupp 2005)
Clear Direction of Innovation Strategies	(Cooper, 2003) (Oke, 2007) (Lightfoot, & Gebauer, 2011)
Sufficient human Resources	(Zeithaml and Bitner, 2003) (Ottenbache et al, 2006)
Successful financial performance	(Johne, 1999)

2.1.1 Business philosophy and management

It is commonly mentioned that business philosophy is an important factor in fostering a workplace that encourages idea generation and an atmosphere that supports innovative activities across the organization.

To fully benefit from new ideas, the culture of an organization plays an important role. Fear of failure should not exist. In addition, excessive bureaucracy can stifle innovation (Johne and Storey, 1998). Focusing on new success factors provides further interesting insight into new service development success. The survey results indicated that the new measures in regard to employee management were of fundamental importance (Ottenbacher and et al., 2006).

Business philosophy has emphasized the need for a corporate vision related to the role that new service development plays in organic business development, which facilitates a positive culture and senior management commitment (Johne and Storey, 1998). To develop a new service or product, strong and visible top-management support is a prerequisite when it comes to numbers activities and resources required in the process, such as marketing activities. Top management has the ability to provide and coordinate all resources across the organization and offer practical support.

A positive firm climate is one that supports and encourages risk-taking behavior. New product successes are rewarded and recognized (and failures not punished) and team efforts are recognized, rather than just individual efforts (Cooper, 2003).

2.1.2 Market-oriented products and services

In market orientations, not only should there be new products or services, but also new product development styles should be addressed. The aim is to use market potential as fully as possible. To achieve success, a strong market orientation must be built into every stage of the new product process, which includes: (1) idea generation by focusing on the customer, and using the customer as a source of ideas, (2) product design by employing market research as an input, not just an after-the-fact check, (3) development via constant customer contact and feedback, (4) undertaking customer trials via preference tests and test markets to verify market acceptance and launch plan, and (5) during the launch, employing a well-designed, carefully targeted, properly resourced process, guided by a well-conceived marketing plan, based on solid market information (Veryzer, 1998).

The product-innovation advantage in helping companies keep and retain their competitive ability is unquestioned. Products need to be updated and renewed to maintain strong market capability. Therefore, product commercialization has been found to be the most essential stage for the profitability of novel service/products, while enhanced efforts in strategic planning could also lead to increases in the profitability of highly innovative products (Avlonitis et al., 2001)

Firms may benefit from customer ideas and innovations by energetic market research, providing tools to test and/or develop products similar to the ones that are currently offered, or by producing products based on customer designs and evaluating what may be learned from general product development (Gassmann, 2006).

2.1.3 Well-managed customer relationships

Management is the stimulation of ideas to meet customer requirements. The scope of ideas should be wide, all employees should be involved, and ideas from customers cultivated (Oke, 2007).

A thorough understanding of customer needs and wants, the competitive situation, and the nature of the market are essential components of new product success. Recurring success themes include: (1) need recognition; (2) understanding user needs; (3) market need satisfaction; (4) constant customer contact; (5) strong market knowledge and market research; (6) quality of execution of marketing activities; and (7) more spending on up-front marketing activities (Cooper, 2003).

Brentani and Emmanuel (1996) suggest that providing superior service offerings and achieving high levels of customer satisfaction require that service companies and client have an intimate knowledge of each other's needs, capabilities, and processes. As sustainable innovations often require changes in user behavior, it is important to identify key factors facilitating and obstructing their adoption (Heiskanen et al., 2004).

2.1.4 Successful capabilities of integration internal systems

Davenport (1998) said that technological infrastructure is essential for new project to be developed. If these tools and the skills to use them are already in place, a particular initiative will have an easier time getting off the ground.

Product advantage and innovative technology seem to be particularly important for opening up new markets and creating new opportunities (Atuahene-Gima, 1995; Storey and Easingwood, 1994).

Information and communication technologies play (thanks to their data-process orientation and resulting information intensity) a central role in service companies' innovation process (Hipp and Grupp, 2005). Innovative projects are likely to engage all functions and staff of various responsibilities across the company. To expedite relevant activities and enhance communication, internal systems are very important.

One of the main problems found in new service development is integrating the needs of new service operations and processes with those of existing business activities (Langeard et al., 1986). Thus, the fit between a new service and existing system is also more important than in a product-manufacturing context (Johne and Storey, 1998), and careful coordination is needed because of the interdependence of many development projects and service technologies (Edvardsson et al., 1995).

Technological leverage is important to product innovation to build on in-house development technology, utilize inside engineering skills, and implement existing manufacturing or operations resources and competencies (Cooper, 2003).

2.1.5 Clear direction of innovation strategy

Studies have investigated key operations issues in service-operations management including capacity management, design, total quality management, strategy formulation, and flexibility (Oke, 2007). Innovation strategy provides a clear direction and focuses the effort of the entire organization on a common innovation goal.

Innovation strategy provides a clear direction and focuses the effort of the entire organization on a common goal. Management must develop strategy and communicate the role of innovation within a company, decide how to use technology, and drive performance improvements through the use of appropriate performance indicators (Griffin, 1997; Cooper et al., 1999).

Cooper (2003) is explicit about strategies. An effective new product strategy means defining new product goals (e.g., a percentage of business sales to be derived from new products); delineating arenas of focus (e.g., product types, markets, technologies and technology platforms where the business unit intends to concentrate its development efforts); and developing strategies that have a longer-term orientation and are visible to everyone in the business. Management must also deploy the necessary product development resources and maintain a commitment.

2.1.6 Sufficient human resources

Research shows that service employees are a critical factor to the success of the organization, not only because they directly impact customer satisfaction, but also because, as the central subjects of positive word-of-mouth, they are the organization's best ambassadors (Zeithaml and Bitner, 2003).

Ottenbacher, Gnoth, and Jones (2006) suggest that focusing on the new success factors might provide further interesting insight into NSD success. Their survey results indicate that the new measures in regard to employee management are of fundamental importance.

2.1.7 Successful financial performance

Profitability is the overriding concern when evaluating new products (Johne, 1999). If one firm in a given industry or sector successfully introduces an important innovation, the firm will be amply rewarded by a higher rate of profit (Schneider, B. and Bowen, D.E., 1984).

2.2 Factors affecting innovation sustainability

Many studies have investigated the critical success factors of business innovation. In spite of this, a lack of research remains on the factors that contribute to organizations' inability to sustain new product development or service development.

2.2.1 Resource allocation

The most frequently discussed factor of the inability to sustain innovation is resource allocation: too many projects and not enough resources. One of the most important barriers mentioned is typical for SMEs—a lack of resources. Both financial and human resources are often lacking in small and medium-sized firms (Vermeulen, 2005). Unfortunately too many projects are starved of resources—both financial and human. For example, many companies attempt to develop too many projects at the same time and spread their resources too thin (Edgett, 1994). A lack of high quality and experienced development staff is a major barrier to innovation.

Most companies suffer from too many projects and not enough resources to mount an effective or timely effort on each—a lack of focus. This is caused from poor project evaluation and poor project prioritization (Cooper et al., 1998).

2.2.2 Market orientation

A failure to adopt a strong market orientation in product innovation, an unwillingness to undertake needed market assessments, not building in the voice of the customer, and leaving the customer out of product development is not a good scenario (Cooper, 2003).

"Why bother doing this product test or this market study . . . we already know what the result will be." One of the blockers be classify in market orientation is overconfidence, a lack of good market information, and inadequate homework are cited consistently as the number one reasons for new product failure (Cooper, 1999).

Poor market research, inadequate market analysis, a lack of market studies, a lack of test markets, poor market launch, and inadequate resources devoted to marketing activities are common weaknesses found in almost every study of why new products fail (de Brentani, 1989; Griffin and Page, 1993). One reason for poorly perceived service is the mismatch between what the organization intends to provide (its strategic intent) and what its customers may require or expect (customer needs), which may be the result of unsuitable marketing, or poorly specified or delivered service (Goldstein et al., 2002).

2.2.3 Managerial commitment

New services that fail have consistently less rigorous development activities (Edgett, 1994). The Stanford project, a Hewlett-Packard study, and other investigations have found top-management support to be directly linked to new product success (Maidique and Zirger, 1984; Song and Parry, 1996; Wilson, 1991). Although top managers claim to support innovation and NPD and expect innovative behavior from their employees, no incentive structures had been implemented (Vermeulen, 2005).

Employees are often unwilling to get involved in development activities such as new products. Job descriptions and reward systems should, ideally, because that may increase their workload. Thus, job design, working team, choice of staff, training, and reward systems are of paramount importance (Edvardsson and Olson, 1996).

Another scenario that shows an apparent lack of commitment is one in which the new services tend to be peripheral to the company's main line of offerings or not part of the firm's core service. This will cause a projected insufficient budget of potential

market research or customer acceptance study and the marketing strategies will be less carefully designed (de Brentani, 1995).

2.2.4 Product champions

When comparing unsuccessful firms with successful firms, it has been found that new product champions or service-project champions managing a service offering into the launch phase of the process increases the chance for success (Martin and Horne 1993). Product champions, who are often in senior positions, are prepared to support new service initiatives and have the ability to ensure commitment to projects in terms of resources. They are also able to overcome delays and difficulties during the innovation process and play an essential role in successful innovations (Shane 1994; Chakrabarti 1974).

Many NPD attempts fail because there are no product champions involved in the NPD projects from all sorts of barrier (Vermeulen, 2005). Champions are crucial in initiating and stimulating an overall climate for innovation. The absence of such champions often results in major problems for NPD teams (Markham and Griffin 1998; Martin and Home 1993).

2.2.5 Project management

Unsuccessful projects are often due to poor project management. In a project resource planning has not been good program, for example, not prepare enough skill, as Cooper (1999) mentioned, complex projects require a multitude of technical and people skills to be an effective, well-rounded team leader or player. One recurring problem is a lack of experience and/or education of the people expected to undertake new product projects.

Time planning in projects is also an important factor in project management. If a project is rushed in reaching a deadline, market studies may have to be eliminated or product test time shortened. Cooper (1999) suggested that the strongest driver of cycle-time reduction is the use of a true cross-functional team.

Chapter 3: Research Methodology

3.1 Research Framework

The research objectives for this study include identifying indicators of service-innovation success, examining business sustainability of service innovation, and analyzing factors affecting the sustainability of service innovation.

To address the first objective, this study will examine factors identified in service innovation in literature and compare these factors with innovation-award programs to identify the practical measurements of service innovation.

To address the second research objective, this study plans to examine innovation-award programs and business performances of award-winning companies four years after their awards. The goal is to understand how these firms sustain innovation over the long term.

To address the third objective, this study will attempt to delve into the factors that cause obstruction but have not yet been researched. Case studies are concerned with how and why things happen, allowing the investigation of contextual realities and the differences between what was planned and what actually occurred. A case study is not intended as a study of an entire organization but rather as a focus on a particular issue, feature, or unit of analysis (Anderson, 1993). The method, which enables researchers to understand complex real-life activities in which multiple sources of evidence are used to probe an area of interest in depth, is particularly appropriate(Patton, 1987).

Comparative case studies will be conducted to collect data required for this research and succeeding analysis. Following the four applications for a case-study model presented by Yin (1994), this research will:

- Investigate and hypothesize the factors that cause a lack of innovation sustainability in companies;
- Compare case-study companies in a companies' industry using hypotheses;
- Analyze the foregoing results and conduct interviews;
- Explore the factors that deteriorate the sustainability of the case-study companies and any other issue that has not yet been addressed.

3.2 Research process

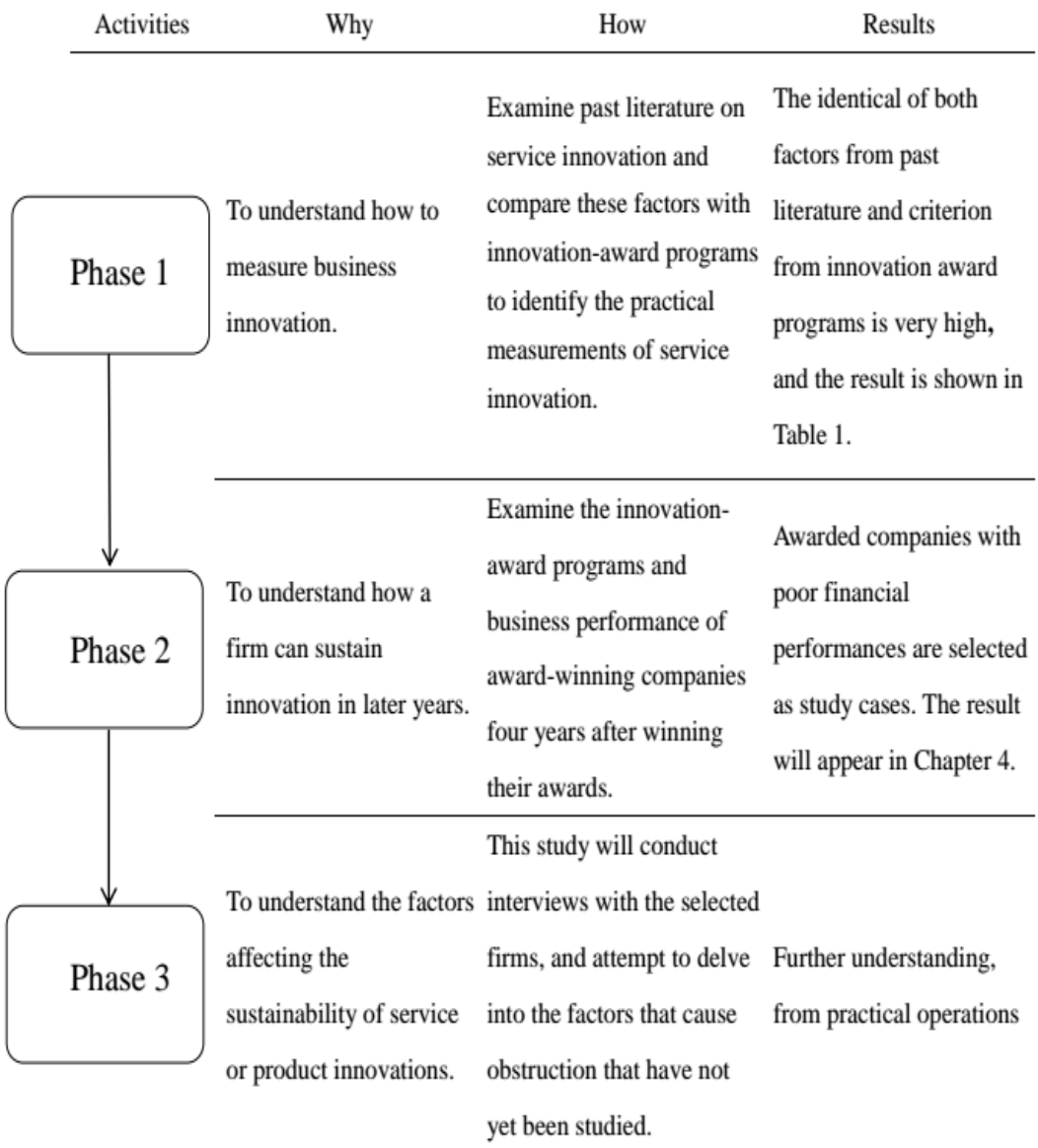

Figure 1: Research process

3.3 Phases one and two: case analysis

3.3.1 Business innovation indicators

Identical factors reflecting business-innovative capabilities in the literature and judgment criteria used in award programs is very high, and their relationship is shown below.

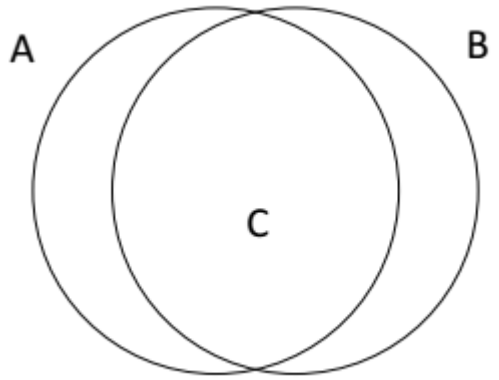

Figure 2: The relationship between literature and judgment.

A: Factors reflecting business-innovative capabilities in the literature.
B: Judgment criteria used in award programs.
C: (Business innovation indicators) =A∧B.

3.3.2 Case selection

Profitability is the overriding concern when evaluating new products (Johne, 1999). If one firm in a given industry or sector successfully introduces an important innovation, it will be amply rewarded by a higher rate of profit (Schneider, B. and Bowen, D.E., 1984). Thus, it is reasonable to judge business sustainability on financial performances. The selection of the award-winning programs based on innovative and national competition is shown in Table 2 below.

Table 2: List of Selected Innovation Competition Programs

Program Code	Program name
A	National Award of Outstanding SMEs, Taiwan
B	Achievement in Excellence and Innovation Award, Taiwan
C	Business Excellence and Innovation Award, Taiwan
D	Queen's Award for Enterprise on Innovation, England
E	Chicago Innovation Awards, the United States
F	SME Recognition Award—SME Innovation Excellence Award, Malaysia
G	Business Excellence Standards—Innovation Excellence Awards, Singapore
H	Global Telecoms Business Innovation Summit and Awards
I	European Business Awards
J	European Cloud-Based Authentication Service New Product Innovation Award

Due to data accessibility and convenience in conducting field interviews, this research will focus on Taiwan. Winners from various national business-excellence awards and service innovation-award programs in 2009 have been targeted for the first-round selection. To observe how well or how poorly case companies sustain their innovations, a follow-up with operation profitability growth and overall production values of each industry between 2009 and 2012 will been completed.

3.4 Phase three: case study

"Do award winners live happily ever after?"

The study is an attempt to understand what factors affect the sustainability of service or product innovation. Thus, the study uses the result of 2.2 as hypothesis factors that cause a lack of innovation sustainability within companies.

The hypothesis factors will be used in interviews with selected firms to delve into the question of why companies are unable to sustain innovation. After the interviews, we will analyze and consolidate the results to disclosure as-yet-explored reasons that cause firms to be unable to sustain innovation.

Chapter 4: Preliminary Analysis

4.1 Judgment Criteria Used in Award Programs

It is difficult to measure the achievements of service-oriented organizations. Several national and foreign business-excellence award programs and innovation-award programs use certain judging criteria that provide valuable references in this area. Below, we outline the assessment indicators used in business excellence and innovation-award judgment processes that have been collected from the programs in Taiwan, as well as in other countries.

Table 3: Judgment Criteria Used in Award Programs

Program / **Criteria**	A	B	C	D	E	F	G	H	I	J
Business Philosophy	V					V			V	
Product/Service/Market	V	V	V	V	V	V		V	V	V
Customer Relationship		V	V	V		V	V	V	V	V
Operations and Technology	V	V	V			V	V	V		V
Strategy in Innovation	V	V			V		V			
Process	V		V			V	V		V	
Financial Performance	V			V	V	V	V			V
Human Resources							V			

4.2 Financial performances of case-study companies

The literature review has attested to the domains that raise strong academic interests and pragmatically constitute the judgment criteria used in the award programs.

The criteria are reputedly reasonable and unprejudiced taking the prizewinners to follow up on how the businesses can prosper and sustain with innovations.

As this research is intended to examine what makes case companies unable to sustain innovation, the relatively inferior enterprises' performances have been identified, shown as Table 4.

Table 4: Financial Performances of Selected Case Companies

Growth Rate (%)	**2009–2010**	**2010–2011**	**2011–2012**
Operating income Growth rate in optoelectronic materials and components manufacturing.	103	76	18
Company A's operating income growth rate.	24	-31	10
Company B's operating income growth rate.	-11	24	9

A preliminary finding is shown below:

- In the first year, 45% of the firm performance is above the industry average;
- In the second year, 18% of the firm performance is above the industry average;
- In the third year, 55% of the firm performance is above the industry average;
- If innovation is sustained in the first and second year, it usually remains above average in the third year.

Chapter 5 Research results Result and Analysis

5.1 Case industry

Table 5: Respondent information

	Company A	**Company B**
Interview hour	1.5hour	2hour
Professional titles/ Working Experiences	1. Human resource manager/6years 2. Information technology Management/5years	1. Public Relation manager/5 years 2. Information technology Management/7years

Electro-Optical Industry refers to the manufacture, use photovoltaic technology components, as well as all commercial activity using optical elements are key components of the equipment, appliances and systems. Electro-Optical Industry is divided into six categories, namely, photovoltaic components, optoelectronic displays, optical input and output, optical storage, optical communications, laser and other optoelectronic applications. The upstream of selected cases is optical components manufacturers, and the downstream is the product application such as projector, mobile projector, digital video camera, car cam.

Global Optoelectronics Industry Development Status and Trends: 2001 due to the global economic downturn, making the overall value of the global photovoltaic industry has a recession phenomenon; 2003 Optical production value has a slight growth driven by the individual industries; Every global financial crisis in 2009 led to difficulties in financing, large investment frustrated, reversal of supply and demand in an oversupply situation, causing manufacturers to delay the revocation order or customer orders, system settings tends to be conservative, so the price fell. Both selected company A and company B won the international innovation award in research development sector.

5.2 Case one: Company A

Company A reached only 23% of the industry average growth rate in 2010, reached only -40% of the industry average growth rate in 2011, reached only 55% of the industry average growth rate in 2012.

5.2.1 Company A Overview

Company A has 820 employees, and the capital is 1.2 billion NT Dollars. Company A committed to independent research and development, design, manufacturing various types of optical modules and optical components, and provide customers with integrated customized service. In 2010, company A move their critical technologies and processes from the China back to Taiwan for integration of upstream material supply.

5.2.2 Human Resources management

New employees were led by senior staff, and there had an employee training center established on 2010, members of the training center are moved back from the China branch offices. When multiple projects were processed simultaneously, the company broke the functional organization structure, each department mutual support.

5.2.3 Company Process and Policy

Not much change in the business process company after winning the award, The Company A hold an annual innovation competition for encouraging employees to innovate in various areas. The winning project was imported in company actual, so there always had a Product Champion to support the new product/service.

5.2.4 Technologies and Innovation Strategy

Systems were mostly self-developed systems, and adapted the parallel import policy. Company A use Data Center as their Knowledge Management System. A clear innovation strategy was different at different times, for example, in 2010, when company decided to move critical technologies from China to Taiwan, the innovation strategy was about the limitation of innovation time and standardization of all the processes.

5.2.5 Values of the company for innovation

Table 6: Values of the company for innovation: Company A

	Weight (0-10)
Business Culture and Management	8
Market-Oriented Products and Services	9
Well-Managed Customer Relationships	9
Successful Capabilities of Integration Internal Systems	7
Clear Direction of Innovation Strategies	9
Sufficient human Resources	9
Successful financial performance	7

5.3 Case two: Company B

Company B reached only -10% of the industry average growth rate in 2010, reached only 31% of the industry average growth rate in 2011, reached only 50% of the industry average growth rate in 2012.

5.3.1 Company B Overview

Company B has 300 employees, and the capital is 7 billion NT Dollars. The company focuses on digital security monitoring system research development, the core technologies are image capture, image analysis, image compression, and image processing. Company B continues to the innovation of product development section only, carried out by a specific department, larger innovation was published about three times a year, there is no innovation activity in other departments.

5.3.2 Human Resources management

Company B had no standard training process for new employees. When multiple projects were processed simultaneously, the company broke the functional organization structure, each department mutual support.

5.3.3 Company Process and Policy

No practical policy to encourage innovation activity; there's no product champion to supply a new product/service. After winning the award, Company B changes the human resource integration and inventory process, apart from this, Company B had no other specific stander process for each department.

5.3.4 Technologies and Innovation Strategy

Company B had no specific innovation strategy, and their core Information System was outsourcing, only small software were developed by their own, even there had some bugs when different system are integrated.

5.3.5 Values of the company for innovation

Table 7: Values of the company for innovation: Company B

	Weight (0-10)
Business Culture and Management	7
Market-Oriented Products and Services	5
Well-Managed Customer Relationships	6
Successful Capabilities of Integration Internal Systems	4
Clear Direction of Innovation Strategies	6
Sufficient human Resources	6
Successful financial performance	7

5.4 Case Comparison

Table 8: Comparison table of Company A and Company B

	Company A	**Company B**
Business Culture and Management	Has practical policy to encourage innovation activates	Innovation activity is not be encouraged
Market-Oriented Products and Services	Use POS system to survey what market need	Only use original experience to decide what product/service will be developed
Well-Managed Customer Relationships	Do not have specific strategy with CRM.	Do not have specific strategy with CRM.
Information Technology	All system are developed by headquarter in Taiwan.	Core IT is outsourcing and each department need to develop their software by their own, sometimes has bugs.
Clear Direction of Innovation Strategies	No.	No.
Human Resources Management	1. New employees have stander training process in Training Center. 2. Lecturer Training Plan is ongoing. 3. When lack of human resource, each department should mutual support.	1. No stander training process. 2. When lack of human resource, each department should mutual support.
Company Process Management	All processes need to match the stander with policy and system.	Only inventory and order process have stander process.
Knowledge Management	Use Data Center as Knowledge Management System, but usage is not high	Has no Knowledge Management System

5.4.1 Factors sustaining innovation in studied cases

In Chapter2.2 we found some factors that may affect innovation sustainability, below is the analyzed result through the interviews. The table shows the comparing of two companies within those factors.

Table 9: Comparing the factors sustaining innovation in case interviews

	Company A	Company B
Resource allocation	Each department could apply resource for their own innovation project. When lack of human resource, each department should mutual support, due to last point, Company A's employees needed to work overtime frequently.	Resources were focus on R & D department, the company attempted to use the most part of resources to maintain the quality of the product. When lack of human resource, each department should mutual support.
Market orientation	Use POS system to survey what market need. In 2010, Company A started to integrate the supply chain to enhance the Market orientation in order to innovate the right product.	Only use original experience to decide what product/service will be developed, that made Company B couldn't catch up the train to earn more profit in 2011.
Managerial commitment	Innovation activities are supported by each manager of department, because Company A had annual Innovation Project Competition each year, this phenomenon may help Company A sustain their innovation.	Company B not only has no Managerial commitment in innovation activity, bit also not sustained their awarded innovation project, they only focus on R&D project.
Product champions	Each new project had a product champion; the product champion usually was the management of department.	The CEO usually being the product champion role.
Project management	Each project should have a clear schedule, and the schedule should be approved by department management.	New product project were responsible for the R&D manager (technical support manager) and a project management.

5.5 Lessons Learned

There are three factors most likely have a great impact of innovation sustainability: 1) Well-Managed Customer Relationship, 2) Clear Direction of Innovation Strategies and 3) Knowledge Management.

According these tow cases analysis, this thesis concludes some factors should be noticed in innovation activity that Company A and Company B both lack of.

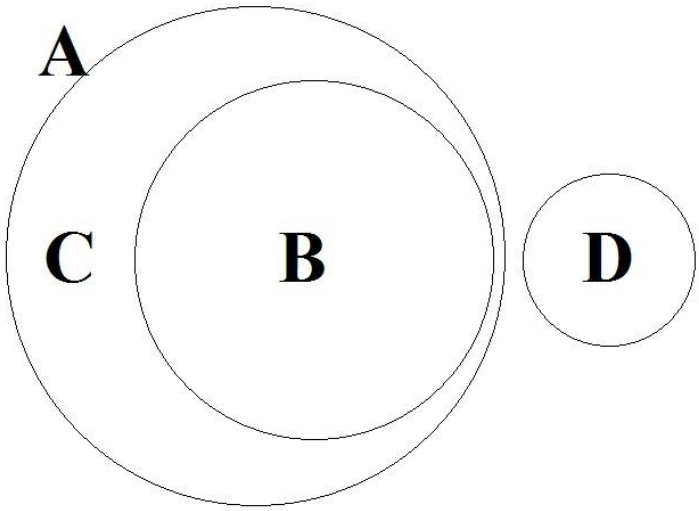

Figure 3: Key factors for sustain the Innovation advantage

A: Business innovation indicators

B: Factors that Company A and Company B both have

C: Factors for sustain the Innovation advantage should be noticed

D: Potential factors for sustain the Innovation advantage

Table 10: Innovation factors of different part

	Factors
Factors of A	• Business Culture and Management • Market-Oriented Products and Services • Well-Managed Customer Relationships • Information Technology • Clear Direction of Innovation Strategies • Human Resources Management • Company Process Management
Factors of B	• Business Culture and Management • Market-Oriented Products and Services • Information Technology • Human Resources Management • Company Process Management
Factors of C	• Well-Managed Customer Relationship • Clear Direction of Innovation Strategies
Factors of D	• Knowledge Management

5.6 Findings

The purpose of this study is to understand, measure, and maintain the sustainability of business innovation. Innovations in services have led to the greatest level of growth and dynamism over the past several years in terms of economic activity (de Brentani, 2001). In addition to innovation, sustainability is of utmost importance for any enterprise to succeed. It is intriguing to follow up on the performance of companies with a record of being innovative to learn factors that contribute to the ability to sustain innovative capabilities.

5.6.1 Well-Managed Customer Relationship

As mentioned in Chapter 2, one of the barriers that impede organizations to sustain their innovation is Well-Managed Customer Relationship. As sustainable innovations often require to identify key factors facilitating and obstructing customers' adoption (Heiskanen et al., 2004)

Information System assists with the re-design of a business process by facilitating changes to work practices and establishing innovative methods to link a company with customers, suppliers and internal stakeholders (Hammer and Champy, 1993), CRM applications take full advantage of technology innovations with their ability to collect and analyze data on customer patterns, interpret customer behavior, develop predictive models, respond with timely and effective customized communications, and deliver product and service value to individual customers. Using technology to "optimize interactions" with customers (Eckerson and Watson, 2000).

Table 11: Interview Record - Company A - Customer relationship Management

Case Description
According to the interviews, Company A did not have specific process or technology for Customer Relationship Management; they used a simple sales system to record the inventory and order, but not analyzed those data to make useful information for managing their CRM.
Influence
Company A's performance decrease 31% in 2011, and the industry average growth rate was 76%. According to the interview, the factors caused this phenomenon was the lack of Customer Relationship Management cause a failure of market forecast, there were overfull customer inventories, and the shipments were decreased by customer inventory adjustment.

Table 12: Interview Record - Company B - Customer relationship

Case Description
According to the interviews, Company B only committed to make sure their quality of products, and did not have Customer-centric Business Process or enterprise-wide strategy.
Influence
The IT manager of Company B expressed that their product is good, and there's no problem in customer site, so they didn't have to spent budge on Customer Relationship Management. Given these factors, Company B cannot notice the Customer Destocking in 2010, and the Customer Destocking effected orders, and made the company's revenue declined.

5.6.2 Clear Direction of Innovation Strategies

As mentioned in Chapter 2, innovation strategy provides a clear direction and focuses the effort of the entire organization on a common innovation goal. Management must develop strategy and communicate the role of innovation within a company, decide how to use technology, and drive performance improvements through the use of appropriate performance indicators (Griffin, 1997; Cooper et al., 1999).

Table 13: Interview Record - Company A - Clear Direction of Innovation Strategies

Case Description
According to the interview, company A did not have specific innovation strategies innovation. Although they have annual innovation competition, but the direction of innovation in each project of department was too diversity, that cause resource wasted.
Influence
Human Resource Manager complained about that, there were too many different projects needed human resource, so they had to broke the functional organization form, lots of employees were asked to support too many different projects in the same time.

Table 14: Interview Record - Company B - Clear Direction of Innovation Strategies

Case Description
According to the interview, the Direction of Innovation Strategies of company B was only in R&D aspect. There's no product champion to support a new product project, because the new product development was in charge of a specific R&D team.
Influence
Not only product and service was not constantly innovating, but also the main information system was outsourcing. Given that, Company B is not attach importance to innovation.

5.6.3 Knowledge Management

Knowledge Management is the factor that not be included international innovation competitions judgment criteria; As mentioned in Chapter 2, this factor has been linked with Customer Relationship Management in the literatures, such as knowledge management projects in the customer support process can improve customer satisfaction.

Knowledge and innovation are the qualities of the new economic era. Companies want to competitive advantage are required to effectively manage those two parts. Knowledge management will affect the organizational innovation behavior (Tapscott, 1996).

Table 15: Interview Record - Company A - Knowledge Management

Case Description
According the interview, Company A did not have specific Knowledge Management System for forecasting market trends or integration the useful information inside the company; they only use Data Center to collect order information and production. In 2014.
Influence
Company A did a failure forecast about the education of bid of Government project, because the demand of Emerging Markets, that including over preordered raw materials, and manufactured too many products, that resulted unexpected inventories and Purchase costs.

Table 16: Interview Record - Company B - Knowledge Management

Case Description
According to the interviews, Company B did not have specific Knowledge Management; they used a simple internal website portal system to access the information of the company and, the functions of the system are news release, member information search and application of the staff activities.
Influence
Company B's performance decrease 11% in 2010, and the industry average growth rate was 103%. According to the interviews, the needs of environment were change in 2010, the Company B aware the change too late, and could not hold the opportunity.

Chapter 6 Conclusion

6.1 Summary

In this section we summarize our findings for objectives 1, 2 and 3; for objective 1, to understand how to measure innovation sustainability. The method is to identify the factors, this thesis surveyed extant literature and judgment criteria used in award programs, and then this thesis concludes seven factors: Business Culture and Management, Market-Oriented Products and Services, Well-Managed Customer Relationships, Information Technology, Clear Direction of Innovation Strategies, Human Resources Management, Company Process Management; for objective 2, to understand how a firm can sustain their innovation in later year. This thesis trace innovation competitions awarded companies, and recorder their financial performance for four years, and the data shows: In the first year, 45% of the firm performance is above the industry average; In the second year, 18% of the firm performance is above the industry average; In the third year, 55% of the firm performance is above the industry average; If innovation is sustained in the first and second year, it usually remains above average in the third year. for objective 3, to understand the factors affecting the sustainability of service or product innovations, this thesis conduct interviews with selected firms, and to identify the Factors for sustain the Innovation advantage should be noticed and Potential factors for sustain the Innovation advantage. The previous factors are Well-Managed Customer Relationship and Clear Direction of Innovation Strategies, and the later factor is Knowledge Management.

6.2 Research Contributions

This study examines factors identified in service innovation in literature and compare these factors with innovation-award programs to identify the practical measurements of service innovation, after that, this study examines innovation- award programs and business performances of award-winning companies four years after their awards. Then, this study delves into the factors that cause obstruction but have not yet been researched by Comparative case study method.

The result shows: There are two factors most likely have a great impact of innovation sustainability: 1) Well-Managed Customer Relationship, 2) Clear Direction of Innovation Strategies and, moreover, this study find a Potential Key factors for sustain the Innovation advantage - Knowledge Management

6.3 Research Limitation and Future Studies

This research is focused on optoelectronic materials and components manufacturing, which is high-tech intensive, industry and service-oriented sectors highly relying on foreign materials providing and the integration of upstream and downstream, which may serve limited guidelines for other industries.

Due to constantly changing environment, if companies want to retain their sufficient competitiveness, not only need to innovate constantly, but also emphasis on the correct maintaining and sustaining of the innovation, given that, the factors of service and product innovation needs to be sustained tracking and viewing to meet the competitive environment.

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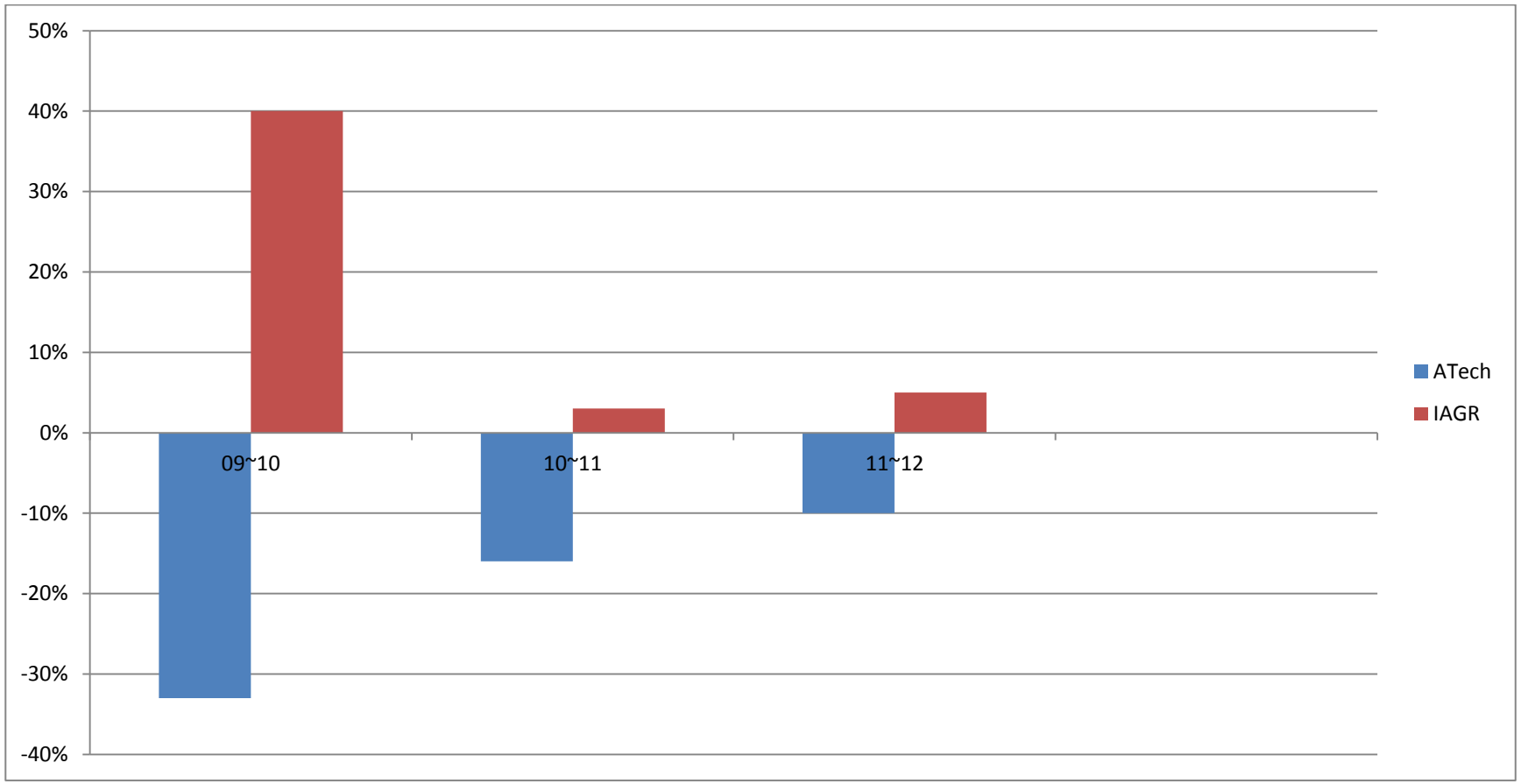
Appendix 1 The financial performance comparison within awarded companies and the industries

Winning companies	Industry sectors	CAGR(09-10)	CAGR(10-11)	CAGR(11-12)	IAGR(09-10)	IAGR(10-11)	IAGR(11-12)
ATech	Electronic components	-33%	-16%	-10%	40%	3%	5%
GVision	Electro-Optical	-11%	24%	19%	103%	76%	18%
SIM	Electronic components	45%	-86%	-20%	40%	3%	5%
STech	Semiconductor Manafacturing	-71%	-21%	-90%	40%	10%	-7%
HIW	Electronic Equipmwnt	10%	10%	16%	8%	-21%	3%
YOptics	Electro-Optical	24%	-31%	10%	103%	76%	18%
PTech	Semiconductor Manafacturing	44%	-11%	-34%	40%	10%	-7%
EChmical	Chemical Industry	9%	-51%	38%	30%	9%	8%
Ec	Electronic Industry	110%	-62%	61%	50%	40%	17%
uBa	Medical biotechnology	76%	48%	15%	40%	10%	-7%
YPHARM	Chemical Biological Medical Technology	7%	1%	-24%	27%	21%	2%

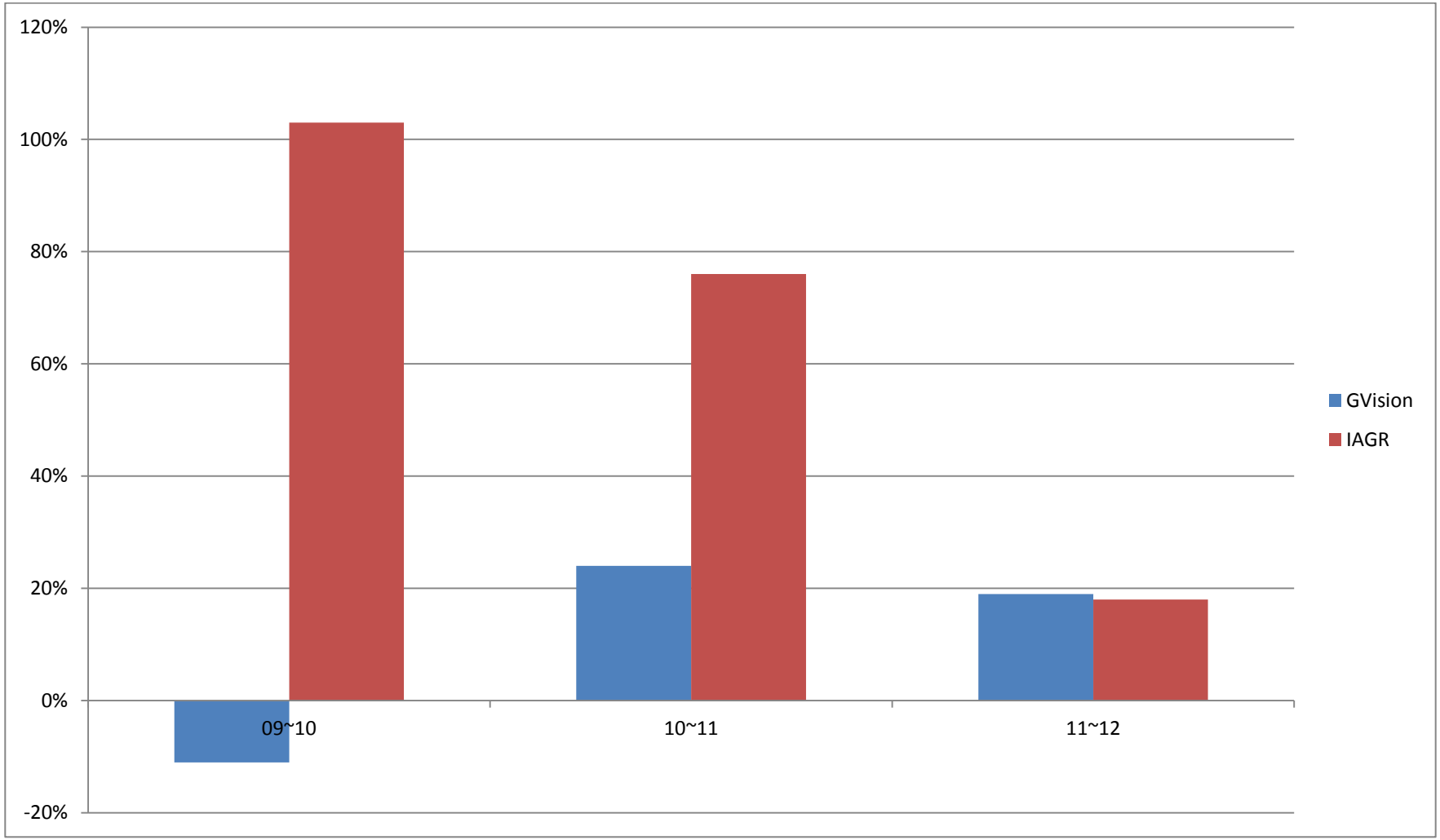
IAGR: Industry Average Growth Rate

CAGR: Company Average Growth Rate

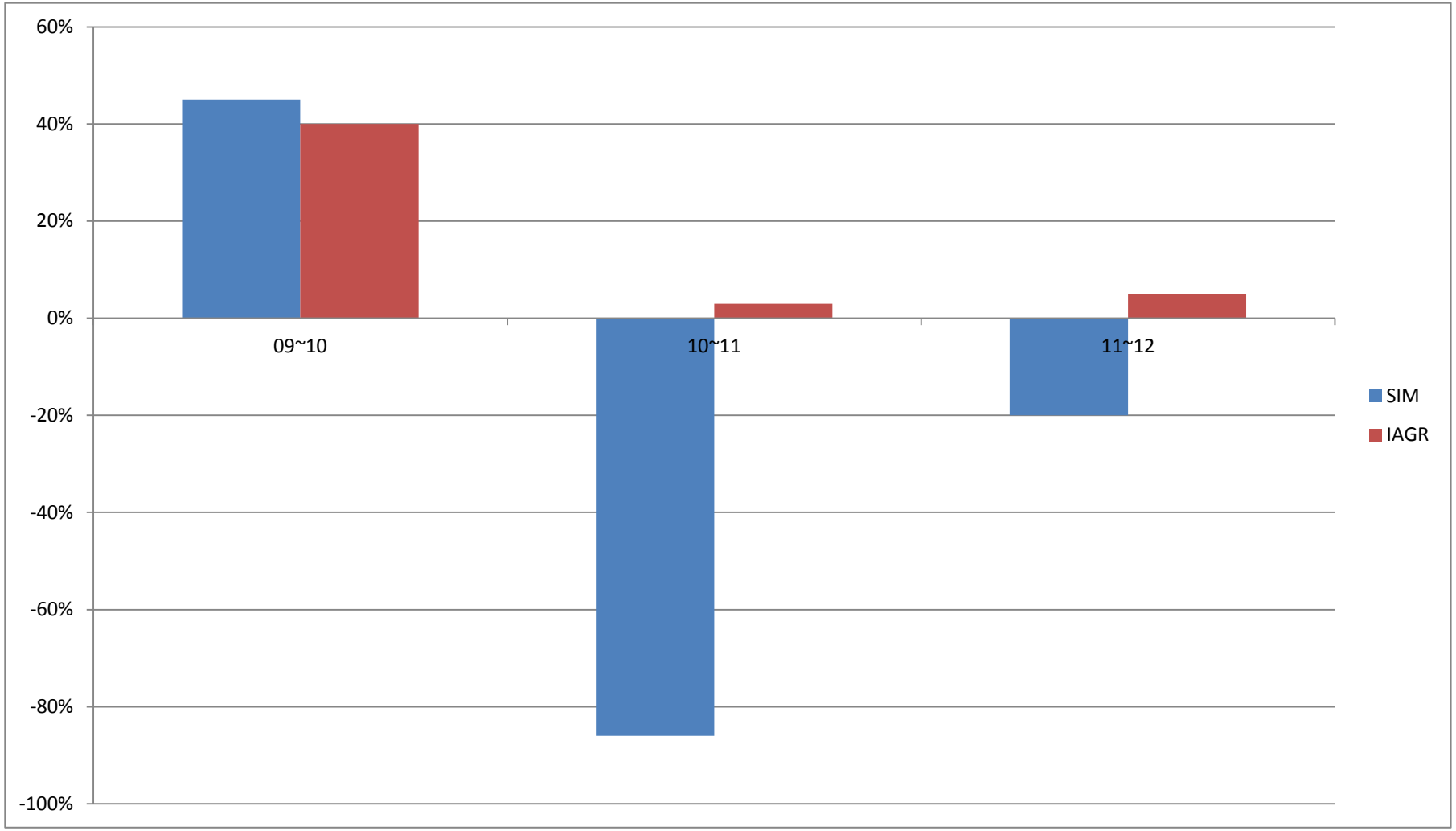
Appendix 2 The performance comparison analysis with each awarded company and their industries



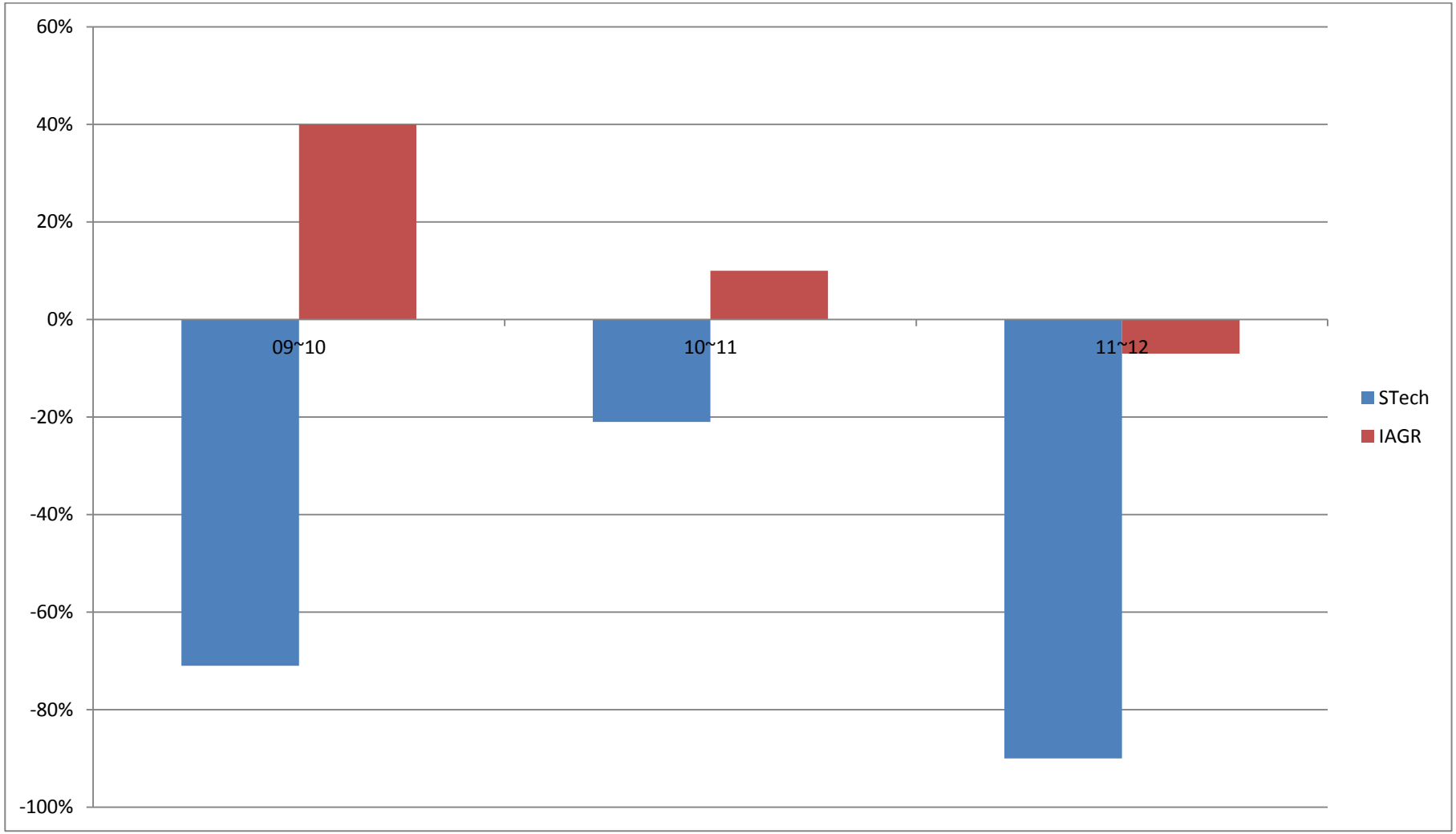
Financial performance of ATech



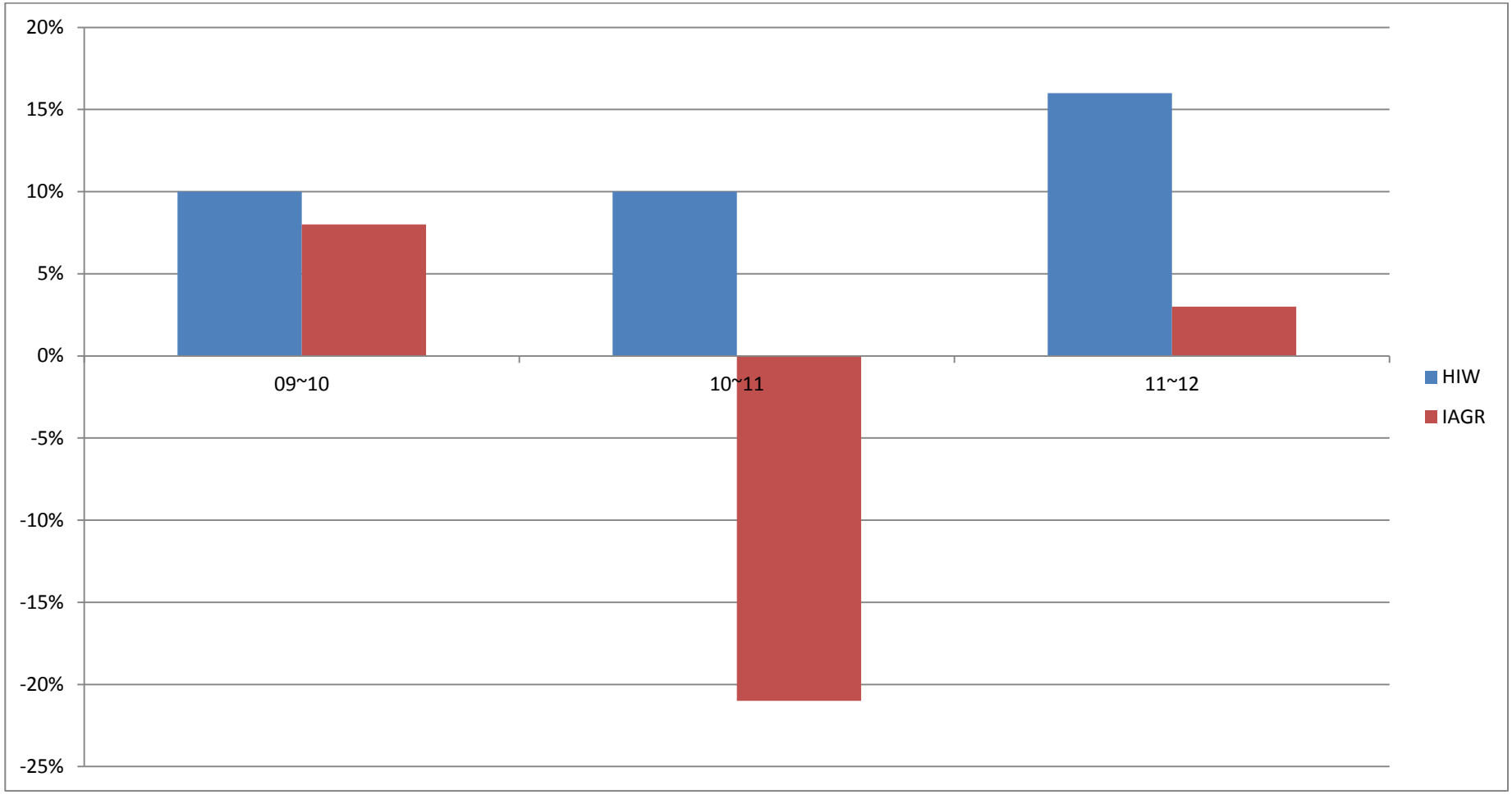
Financial performance of GVision



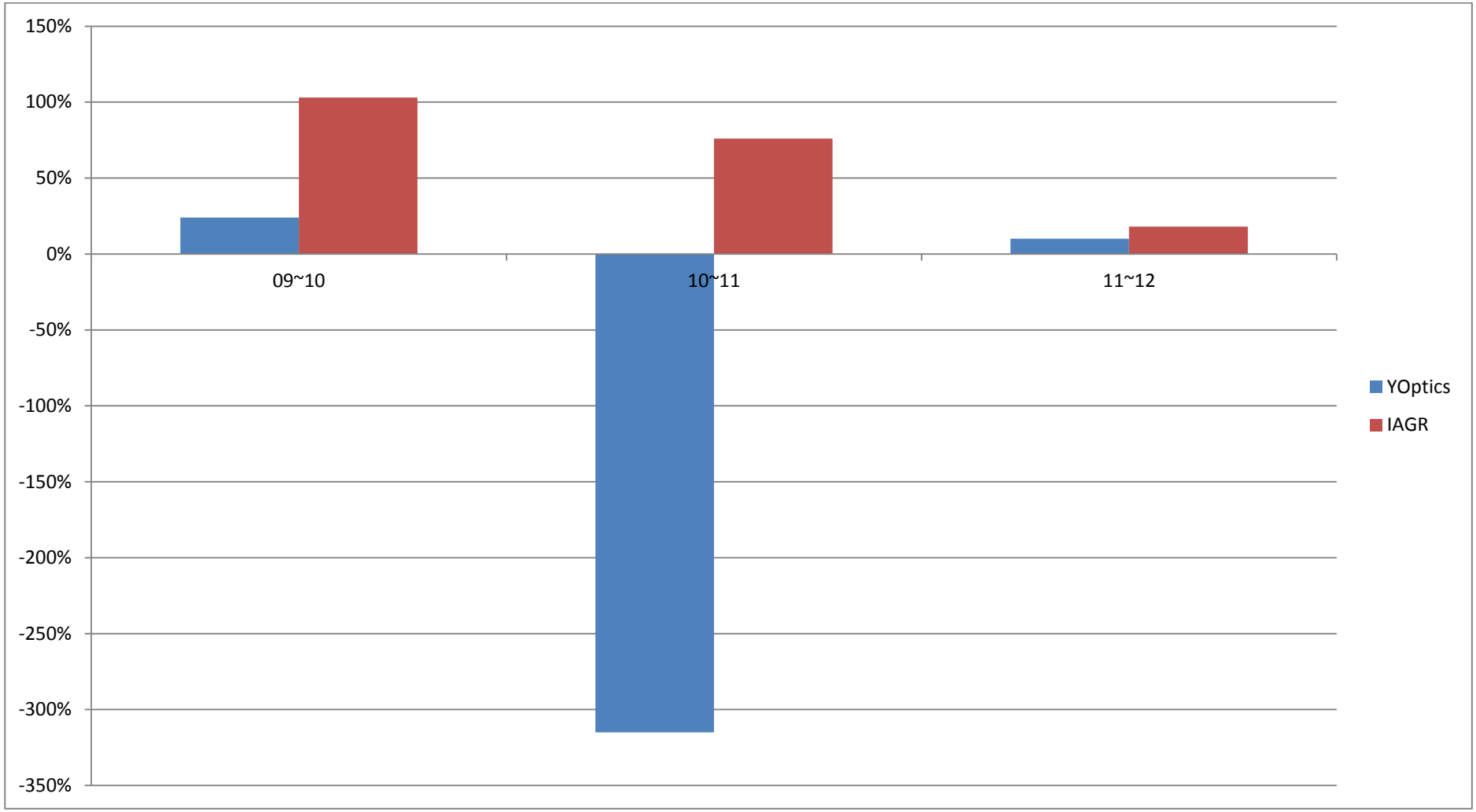
Financial performance of SIM



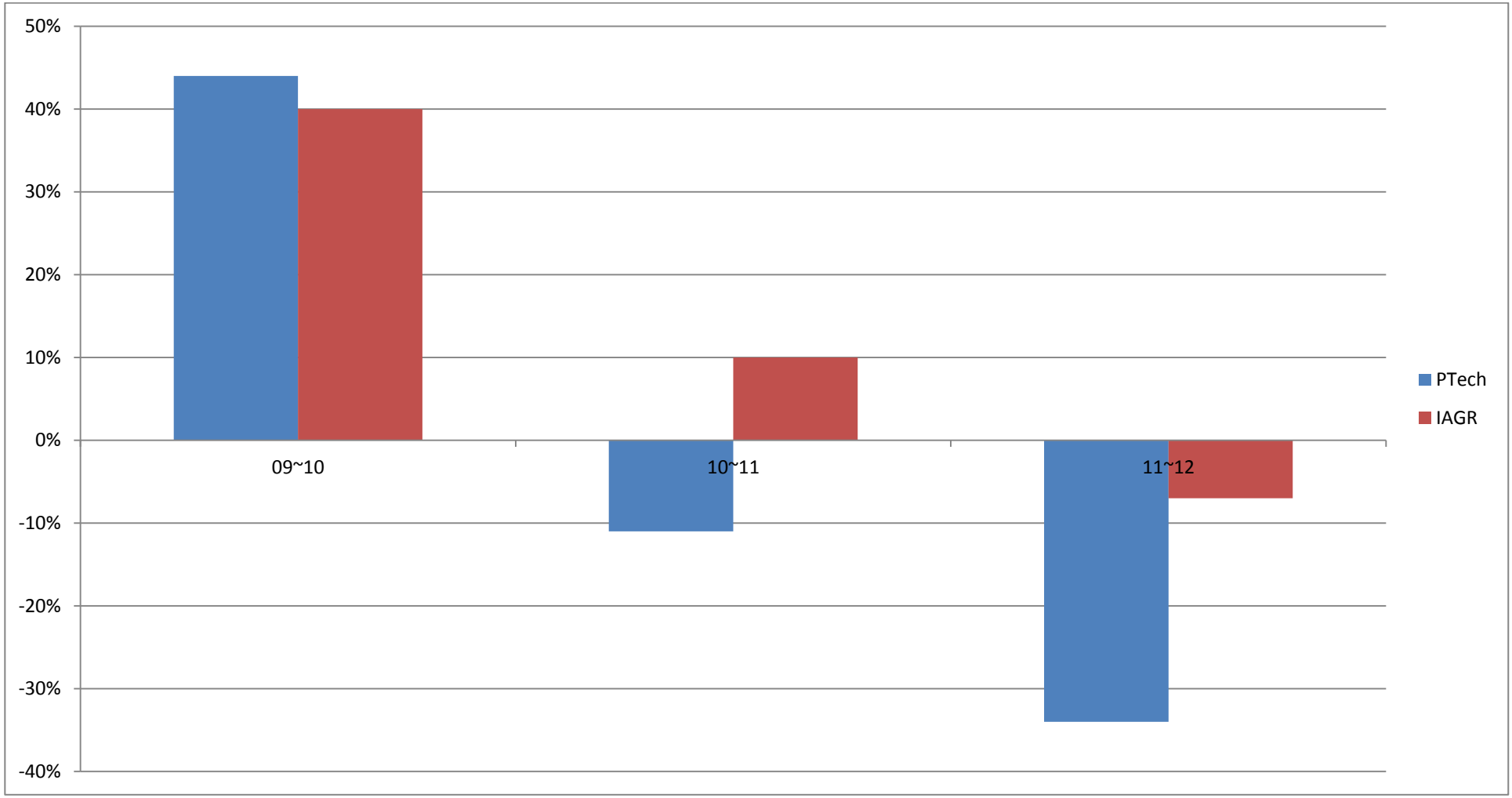
Financial performance of STech



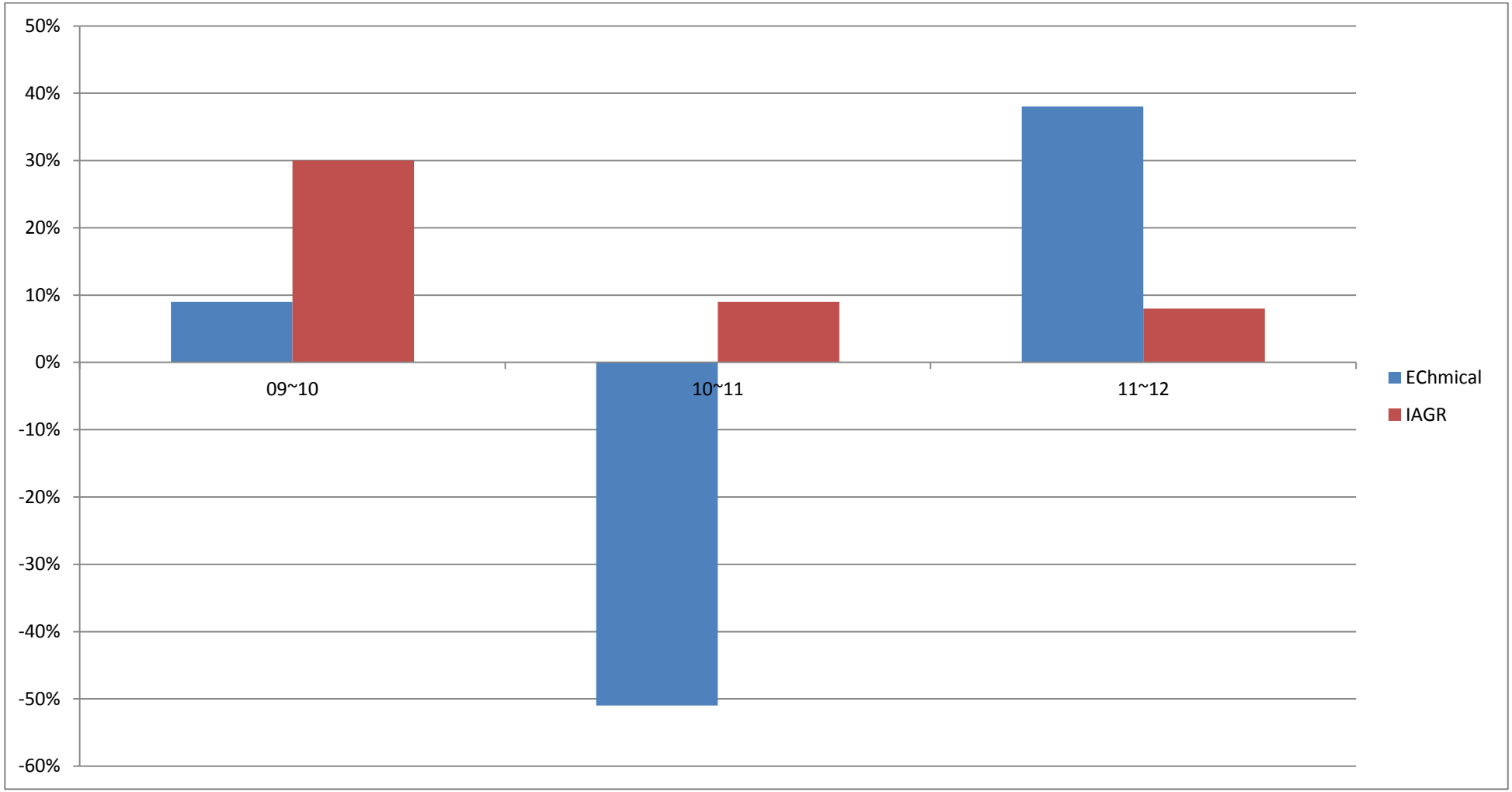
Financial performance of HIW



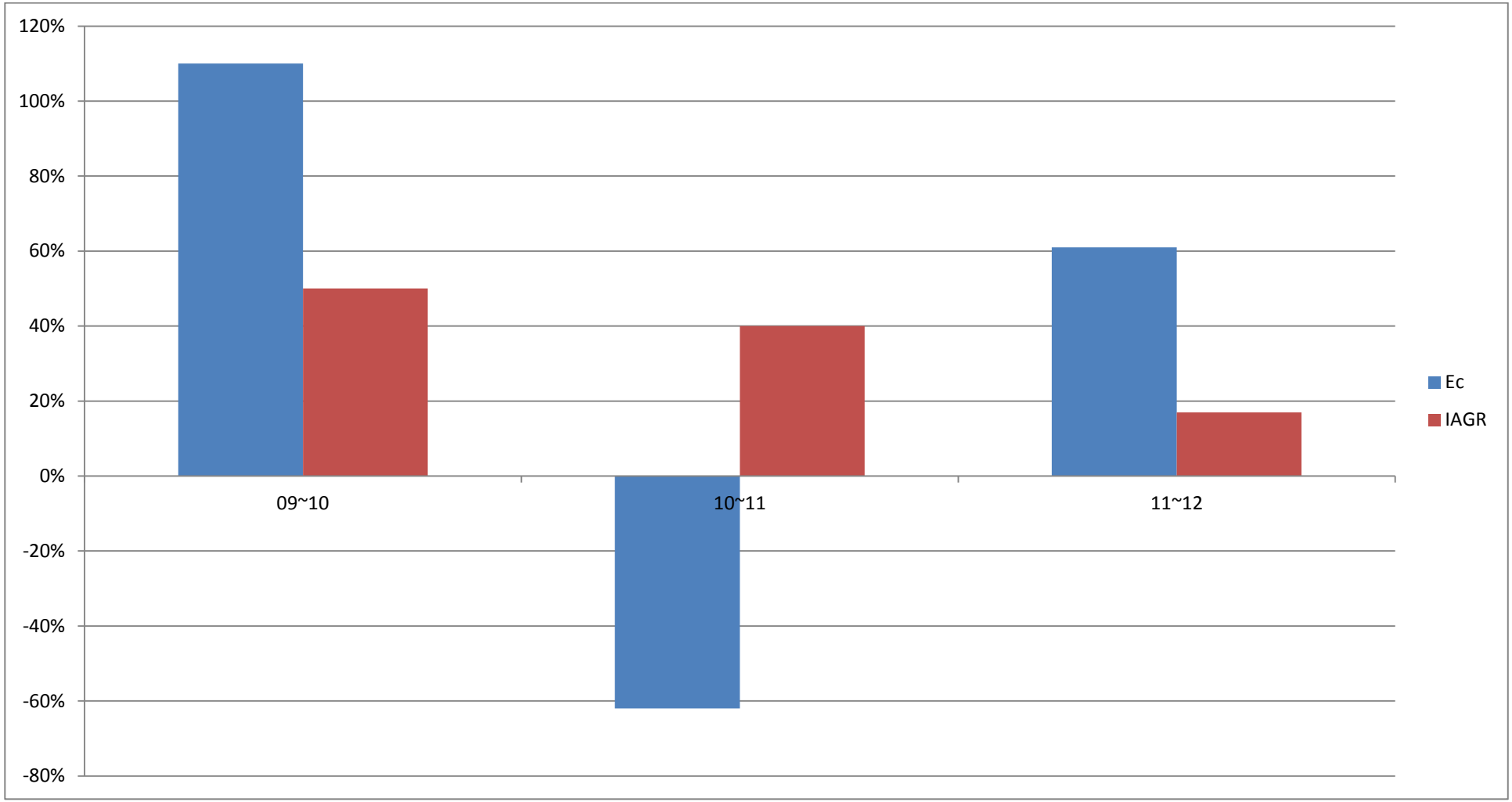
Financial performance of YOptics



Financial performance of PTech



Financial performance of EChmical



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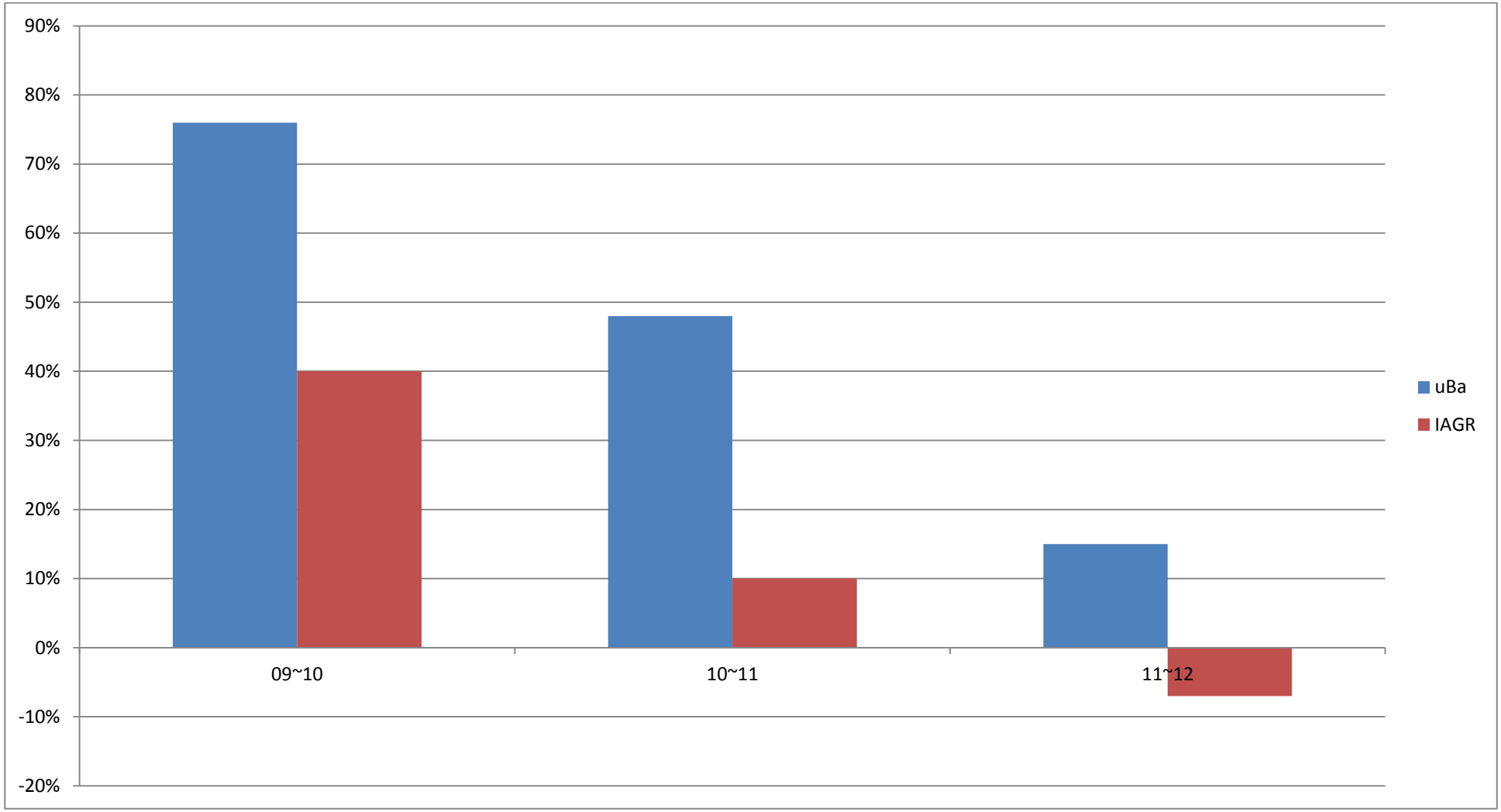
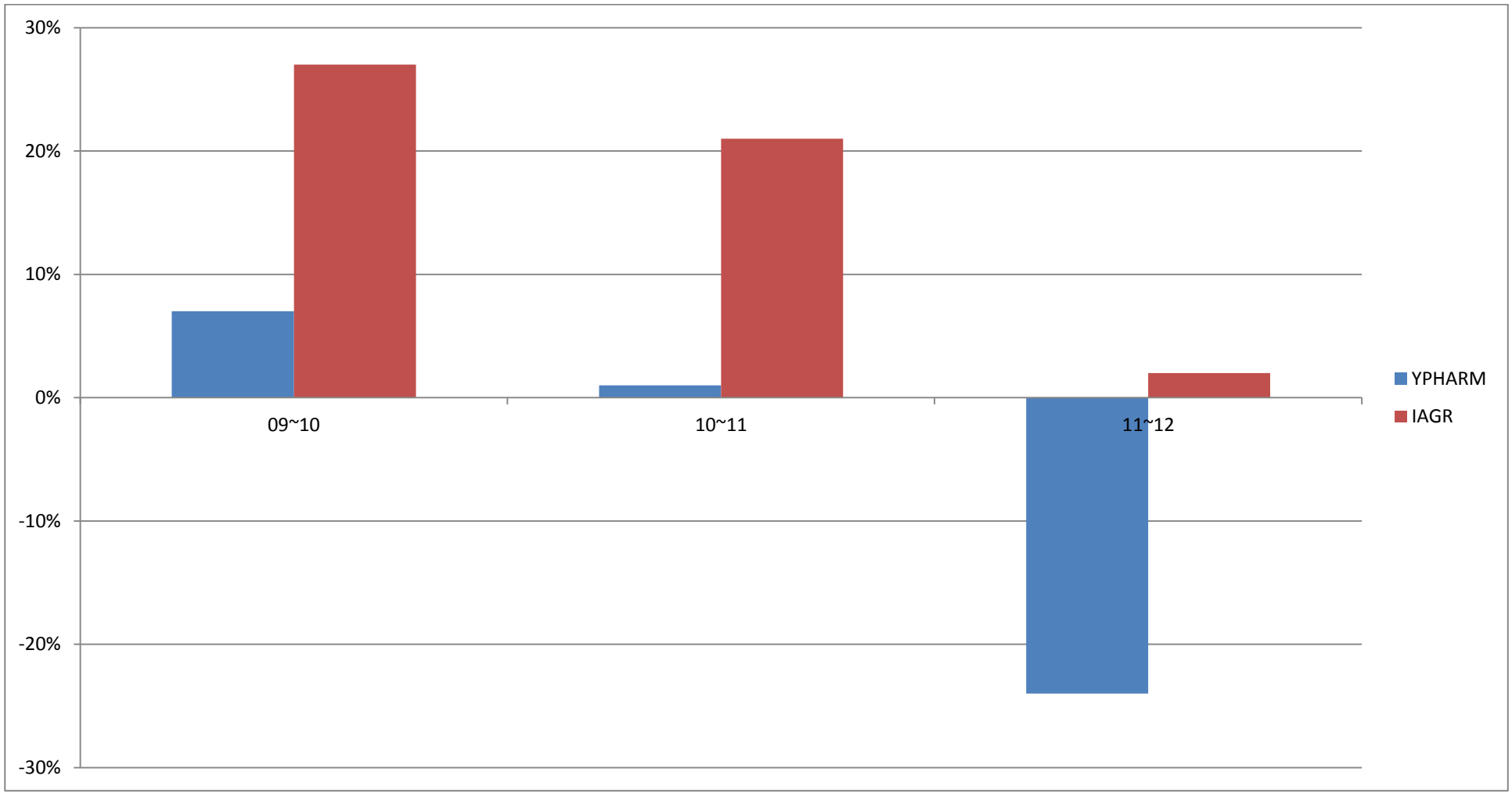


Financial performance of uBa



Financial performance of YPHARM