



**LAB-MOVIE**  
LABOUR MARKET OBSERVATORY  
IN VIETNAM UNIVERSITIES



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# Labour Market Observatory in Vietnam Universities

**LAB-MOVIE**

## **REPORT ON**

The result of WP2 Survey with Enterprises  
in ICT Sector

HANOI UNIVERSITY OF INDUSTRY

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## Table of Contents

1	Overview of ICT sector .....	3
1.1	Contribution of IT and Telecommunication industry .....	3
1.2	Key regions to develop IT and Telecommunication industry in Vietnam .....	5
1.3	The development of human resources in ICT .....	6
1.4	ICT in Hanoi city .....	8
2	Methodology .....	8
2.1	Types of survey .....	8
2.2	Questionnaires .....	9
2.3	Survey duration .....	10
2.4	Enterprises surveyed .....	10
3	Quantitative data.....	11
3.1	Main activities of the surveyed enterprises .....	11
3.2	Staffing of the surveyed enterprises .....	12
3.3	Recruitment situation of the surveyed enterprises .....	14
3.4	Business results and future directions of the surveyed enterprises .....	19
4	Organizational structures and professional figures .....	21
4.1	Types of organizational structures .....	21
4.2	Professional figures .....	23
4.2.1	Software engineer .....	24
4.2.2	Bridge software engineer .....	25
4.2.3	Developer .....	25
4.2.4	Tester engineer.....	26
4.2.5	Multimedia staff .....	27
4.2.6	ERP Deployment Engineer.....	27
4.2.7	Security Analyst .....	28
4.2.8	Software architect .....	29
4.2.9	DevOps .....	30
4.2.10	Database engineer.....	31
4.2.11	Electronics/Telecommunication engineer.....	31
4.2.12	Business analysist .....	32
4.2.13	Project Manager .....	33
4.2.14	IT Manager.....	33
4.2.15	Test Leader .....	34
4.2.16	Technical manager.....	35

# 1 Overview of ICT sector

Year of 2020 and 2021 is considered difficult and challenging for the world economy in general, including Vietnam due to dangerous Covid-19 pandemic. Despite being affected by many consecutive waves of the Covid-19 epidemic, Vietnam's economy in general and the information and telecommunication technology industry as well as recruitment demands for ICT still has made remarkable achievements in 2020 and 2021. ICT industry like every other industry has faced many difficulties and constantly changed to adapt to a new situation – “new normal”. In the context every country around the world are gradually recovering and “standing up” from the difficulties, Vietnam ICT market is also developing in the context of the “new normal” with new stories about business and technology. According to 2021 White book of Vietnam ICT and Topdev Vietnam IT market report, growth of the ICT sector over period of 2016-2020 increases 7.5% with revenue reached approximately 616 billion of USD. The number of employed workers for ICT first time overs one million peoples (1.030.000) with more than 64.000 enterprises.

The following overview of the ICT sector is collected on the data reported in the 2021 White book of Vietnam ICT released by Ministry of Information and Communications of Vietnam, Statistical Yearbook of Vietnam 2021 and Topdev Vietnam IT market report of 2021 and 2022. It shows the overall pictures of the current situation and development of ICT in Vietnam in general and Hanoi City in particular.

## 1.1 Contribution of IT and Telecommunication industry

In the overall picture of Vietnam economy, ICT industry including IT and telecommunication has played an important role and developed considerably in recent years, despite the Covid-19 epidemic revenue from Vietnam's ICT industry in 2021 will continue to have strong growth compared to 2020. It is described in 2021 ICT whitebook [1], ICT industry has become a major export of Vietnam and the world, ranked 2<sup>nd</sup> in the world in exporting mobile phones with revenue of 35.3 billion USD, accounting for 14.2 world market share and up 14.1% compared to 2019. It was also ranked the 8<sup>th</sup> in computer export, occupying 2.4% of the world market; ranked the 10<sup>th</sup> in electronic circuit export, occupying 1.8% of the world market; ranked the 8<sup>th</sup> in printer export, occupying 4.4% of the world market share; ranked the 6<sup>th</sup> in software services; ranked the 7<sup>th</sup> in video game export.

### *IT industry*

IT industry including hardware and software Vietnam's ICT industry has made great progress with an average growth rate of 16.2% in the period from 2016 to 2021. According to Topdev's report [1], in 2021, the revenue of the IT industry will reach 236.1 billion USD. In which, the revenue of the hardware and electronics industry reached 108.5 billion USD. Software industry revenue reached over 5.5 billion USD; digital content industry revenue reached 888

million USD. In 5 years, the IT business community increased 1.8 times with over 44,597 businesses.

Particularly, in the total revenue of this field, although FDI enterprises still account for the majority (more than 86%), the revenue of Vietnamese enterprises in the past year has increased sharply compared to previous years. If in 2018, the revenue of Vietnamese enterprises accounted for just over 3.68 billion USD (out of the total revenue of nearly 103 billion USD), in 2019, this figure is more than 11 billion USD and in 2020 it is nearly 13.4 billion USD). By 2021, the turnover rate of Vietnamese enterprises has increased to 18.779 billion USD (accounting for 13.8%). In the hardware industry, the total number of employees working in this field is approximately 842,458 people which accounts for 78% of total number of employees in IT industry by the end of 2020. Income of software engineer is average 9.419 USD/year in 2020. Average income of labor in hardware or electronic field is about 4.824USD/year in 2020.

### *Telecommunication industry*

The telecommunication industry consists mainly of mobile service, internet service and fixed-line telephone service.

The market share of mobile services provided by operators is also very competitive. According to the statistics of 2020 [1], the number of mobile phones operating in the country was approximately 130 million subscribers with 4 major mobile telecommunications service providers including Viettel, VNPT, MobiFone, Vietnamobile. By the end of 2020, the mobile subscriber market share of operators providing cellular mobile services is lead by Viettel with 56.46%, followed by VNPT with 19.59%, MobiFone with 17.9%, Vietnamobile with 4.37%, and others with 1.68%. For the mobile broadband service, the market is dominated by Viettel at 56% with VNPT and MobiFone tracing at 19% and 18% correspondingly. The number of broadband mobile subscribers (3G and 4G) using data services is increased, and number of mobile subscribers generating normal traffic such as voice and message is decreased. And among the 138 million registered mobile phone subscribers, 45% have subscribed to 3G& 4G.

Consider the internet development, according to the data of 2020, in term of market share for internet service, the fixed broadband service is dominated by Viettel, VNPT, FPT and SCTV with Viettel and VNPT being the largest player of 39% each, FPT with 15.26%, SCTV with 1.86%, and 3.23% for others (Netnam, CMC..).

In 2020, Vietnam's fixed telephone number continued its reducing trend to 3.2 million subscribers. The market share of subscribers of landline telephone services in Vietnam is provided by 3 major operators VNPT, Viettel, SPT. VNPT accounts occupied the highest market share of 63% and ranking second is Viettel with 33%.

In the next part, we can see the development of ICT in regions of Vietnam

## 1.2 Key regions to develop IT and Telecommunication industry in Vietnam

In Vietnam, ICT industry divides hardware and software production into two distinct regions: hardware manufacturing activities located in industrial zone in neighboring provinces of Ha Noi and Ho Chi Minh city meanwhile big cities are places to attract software enterprises such as Ha Noi, Ho Chi Minh city and Da Nang city. According to 2021 White book of Vietnam ICT [1], Bac Ninh and Thai Nguyen are the two leading provinces in the country in term of ICT revenue due to contribution of Samsung manufactures. Table 1 shows list of top 20 localities in term of ICT revenue.

**Table 1 – List of top 20 provinces leading in ICT revenue**

Rank	Provinces
1	Bac Ninh
2	Thai Nuyen
3	Ha Noi city
4	Ho Chi Minh city
5	Bac Giang
6	Hai Phong
7	Vinh Phuc
8	Hai Duong
9	Da Nang
10	Ninh Binh

Rank	Provinces
11	Dong Nai
12	Hung Yen
13	Phu Tho
14	Binh Phuoc
15	Binh Duong
16	Ha Nam
17	Hoa Binh
18	Long An
19	Lao Cai
20	Quang Nam

*Source: 2021 ICT whitebook*

The following table describes provinces attract numbers of ICT enterprises. Big cities are places of ICT companies such as Ho Chi Minh, Binh Duong, Ha Noi and Da Nang city where there are many universities, colleges and vocational schools with a large number of high education people.

**Table 2 – List of top 20 provinces leading in number of ICT enterprises**

Rank	Provinces
1	Ho Chi Minh city
2	Binh Duong
3	Ha Noi city
4	Da Nang
5	Bac Ninh
6	Ba Ria – Vung Tau
7	Dak Lak
8	Thanh Hoa
9	Binh Thuan
10	Hai Phong

Rank	Provinces
11	Quang Ngai
12	Bac Giang
13	Ninh Thuan
14	Can Tho
15	Quang Tri
16	Quang Ninh
17	Phu Yen
18	Ca Mau
19	Dong Nai
20	Long An

*Source: 2021 ICT whitebook*

The below table shows provinces with large number of working people

**Table 3 – List of top 20 provinces leading in ICT labors**

Rank	Provinces
1	Bac Ninh
2	Ha Noi
3	Bac Giang
4	Binh Duong
5	Thai Nguyen
6	Ho Chi Minh city
7	Vinh Phuc
8	Da Nang
9	Hai Duong
10	Hai Phong

Rank	Provinces
11	Hai Phong
12	Quang Nam
13	Hung Yen
14	Quang Ninh
15	Ha Nam
16	Ninh Binh
17	Nghe An
18	Ninh Thuan
19	Kien Giang
20	Tra Vinh

*Source: 2021 ICT whitebook*

### 1.3 The development of human resources in ICT

In the face of the rapid growth of the IT industry, the demand for human resources is estimated to exceed the supply. According to statistics from 2018 to 2022, the human resource demand for the information technology industry in Vietnam is still increasing continuously. Based on TopDev's report on Vietnam IT market 2021, by 2021 Vietnam will still need 450,000 human resources in the information technology industry. Meanwhile, the current number of programmers in Vietnam is only about 430,000 people.

The following tables address statistical data related to ICT human resource training [1].

**Table 4 – University training level**

	Criteria	2018-2019	2019-2020	2020-2021
1	Total number of Uni	237	237	242
2	No of new students	413.277	447.483	-
3	Total no of students	1.526.111	1.672.881	
4	Graduated students	311.599	263.172	
5	Total no of universities training IT, electronics, telecommunication and information security	149	158	158
6	Total no of admission criteria of IT, electronics, telecommunication	51.114	68.435	82.085

	and information security			
7	Ratio of total no of universities training IT, electronics, telecommunication and information security/ total number of universities	63.14%	65.83%	65%
8	Real admission of training IT, electronics, telecommunication and information security	82%	82%	84%

*Source: 2021 ICT whitebook*

**Table 5 – Vocational training level**

	Criteria	2018	2019	2020
1	Total number of Vocational colleges	909	863	854
2	Total annual enrollment target	540.000	560.000	738.165
3	Total no of annual real admission	545.000	568.000	580.000
4	No of graduated students	440.000	494.000	510.000
5	Total no of schools training IT, electronics, telecommunication and information security	412	442	442
6	Ratio of total no of admission of IT, electronics, telecommunication and information security/Total of enrollment	12.53	9.54	7.7
7	Ratio of total no of colleges training IT, electronics, telecommunication and information security/ total number of colleges	45.32	51.22	51.7

*Source: 2021 ICT whitebook*

## 1.4 ICT in Hanoi city

According to the People's Committee of Hanoi City, with the implementation of the objectives in the Hanoi IT Development Planning Master Plan to 2020 and the 2030 orientation, Hanoi needs about 700,000 IT human resources. Only FPT Software Company has a branch in Hanoi, in 2013, FPT recruited 2,000-2,500 employees for the positions of software engineers, project managers, bridge engineers. In 2015, FPT still needs to recruit more than 9,000 employees for IT-related fields and telecommunications.

2016 also marked a turning point in IT development issues in Hanoi. By the end of June 2016, Hanoi City has granted investment registration certificates to 98 foreign-invested enterprises in the IT field outside the centralized IT area in the city. Among them 29 projects were granted new investment certificates with a total capital of over US \$ 1.55 billion

Other large IT and telecommunication enterprises such as Viettel, VNPT, CMC, etc. also opened many branches in Hanoi to attract human resources, especially students from the same field in the context, these two industries are seriously in shortage of manpower. According to a report by Hanoi Department of Information and Communications, in 2017, Hanoi has about 9,700 IT enterprises, an increase of about 31.6% compared to the same period of 2016. Total revenue of enterprises reached more than 10 billion USD and it is going up about 32.4%.

## 2 Methodology

### 2.1 Types of survey

To collect the survey data for ICT sector in Ha Noi, two types of survey was used, that is face-to-face and CAWI. All preparation for face-to-face interview was done such as completing the questionnaires, listing ICT enterprises in Ha Noi and contacting them for interview schedule. Pilots of face-to-face interview was done for 6 enterprises in March 2021. Unfortunately, after that time, Covid-19 spread out in Ha Noi, therefore, CAWI with email and google form survey is applied, instead.

A face-to-face interview was conducted at the pilot phase for six-selected enterprises. The interview schedules were arranged two or three weeks in advance via phone or email. The task of contacting enterprises was done by team members belongs to Center for Enterprises Partnership. For the first interviewed company, we had four members together to participate to learn the sample interview. To implement the interview, a team of two persons was formed: one asked the questions and another fill in the questionnaire form. An interview lasted about 2.5hours. For the interviewed enterprises, most of the answering person is manager such as CEO with technical manager; human resources manager with technical leaders.

Due to the Covid-19, lockdown in Hanoi was implemented several times in 2021 and early 2022, so the face-to-face interview couldn't continue and CAWI with help from Google form was launch. Before deploying the google form, phone call and email for survey were ways to choose and was discussed and tried to do but the results were not good enough. Phone call could not be done due to not ready from companies and difficult to reach when they work from home. Ten enterprises answered by email but lack of information. Therefore, for ten companies answered via email, we finally asked them to response in Google form after the form was built.

CAWI by Google form was very useful tool for collecting the survey data during covid-19 quarantine. For HaUI, to build the Google form, we inherit the form from NTTU. However, the Professional Figures was complicated with many questions and its branches and not suitable within one GG form, so we had built a separated list of each professional figures by GG form and send to enterprises both the normal questionnaires and professional figures under GG form with multiple of links.

For example, the normal questionnaire can be found here:  
[https://docs.google.com/forms/d/1q9h1cCzOpAfpelCoqWtDt2yAM7I67WLviMwm4wMN  
U/edit](https://docs.google.com/forms/d/1q9h1cCzOpAfpelCoqWtDt2yAM7I67WLviMwm4wMNU/edit)

And each professional figure can be accessed here:  
<https://docs.google.com/forms/d/1WtfWXiXgbmpNLi8LVpd63QBjYVWRyZEBUWY-YxsvP4A/edit>

Although the GG form is useful, but all information in the questionnaire were not full answer, we had to find by our-self the missing information through company's website, official recruiting websites, phone calls to companies to complete the questionnaire. These procedures took a lot of time.

## 2.2 Questionnaires

The questionnaires were inherited from NTTU after discussion with them for correction in Vietnamese with some information added.

The questionnaires were designed based on the templates provided by the University of Padova There are 2 questionnaires: one questionnaire about the activities and professions in the ICT sector and one questionnaire about the professional figures in the ICT sector.

The questionnaire about the activities and professions in the ICT sector is used to obtain information on the enterprises' main business activities, their employment of ICT personnel, their perspectives on business development and employment in the sector. The questionnaire about the professional figures is used to obtain information on the job titles, the skill needed in the sector. While the designed questionnaires follow closely the samples provided by the University of Padova, there are questions that have been changed or newly

included on fit the local context. These questions are those that are related to the classification of business activities, types of ownership, the classification of business size, knowledge and skills required for the professional titles.

The questionnaires were tested in the pilot study. After the pilot, the questionnaires were adjusted with some words changed and sentences rephrased to improve the clarity of the questions. The questions about the skills and knowledge required for the professional figures were incorporated into the questionnaire instead of being separated as the original questionnaires.

For the CAWI interview with Google form, the questionnaire can be accessed here <https://docs.google.com/forms/d/1q9h1cCzOpAfpelCoqWtDt2yAM7I67WLviMwm4wMNU/edit>

And the professional figure of the software engineer can be accessed here <https://docs.google.com/forms/d/1WtfWXiXgbmpNLi8LVpd63QBjYVWRyZEBUWyYxsvP4A/edit>

### 2.3 Survey duration

- Pilot survey from March to April 2021: 06 face-to-face enterprises
- Email survey from October to November 2021: 10 enterprises
- Online google form from February to June 2021: 42 enterprises (32 new enterprises and 10-email-answering enterprises re-answered)

### 2.4 Enterprises surveyed

HaUI listed 156-ICT enterprises as database for survey work. This list was selected from HaUI Center for Enterprises Partnership and from official website of VINASA ([vinasa.org.vn](http://vinasa.org.vn)) without overlapping. Out of 156 enterprises, 120 enterprises were chosen by relationship with HaUI and near location with HaUI to contact to interview.

As a result, total number of 48 enterprises participated for surveying in ICT sector in Hanoi. Among them, there were six face-to-face interviewed enterprises, and 42 enterprises answered the online Google form.

Enterprises participated in the face-to-face interview has relationship with HaUI and they accepted interview after two or three weeks of contact by email and phone call.

Enterprises answered online google form was contacted by email. It took time to wait their answers.

### 3 Quantitative data

#### 3.1 Main activities of the surveyed enterprises

Collected survey data is analyzed to show valuable information about the ICT activities in Hanoi. Figure 1 shows the number of places where the enterprises locates their offices. As seen in Fig.1, there are 45% of enterprises having only one working address and 34% of enterprises with more than one working address. This indicates that ICT businesses broaden their activities not only in Hanoi but also in other provinces or there are many branches.

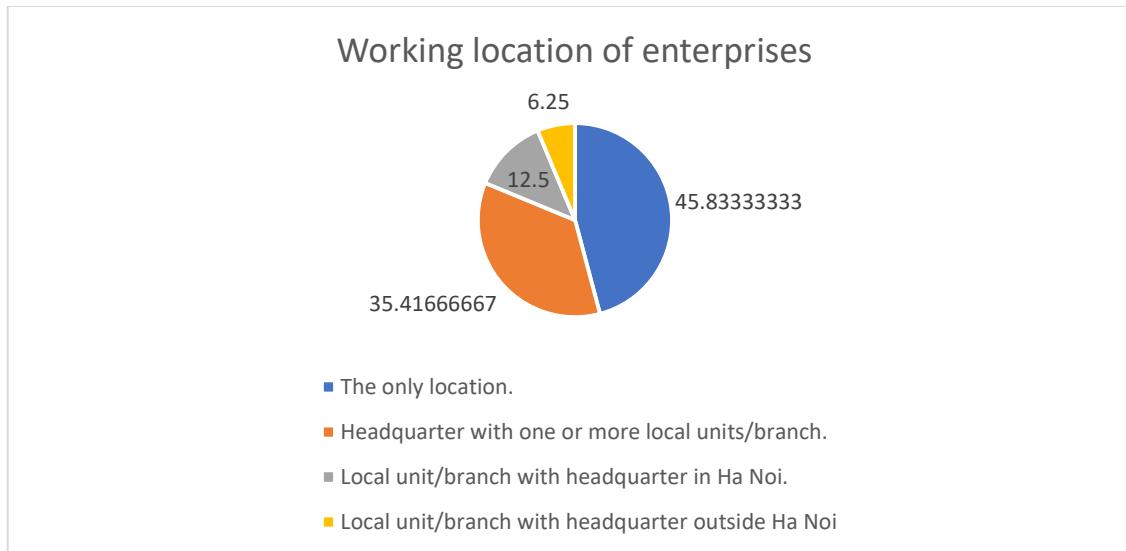


Fig.1 – Working location of enterprises

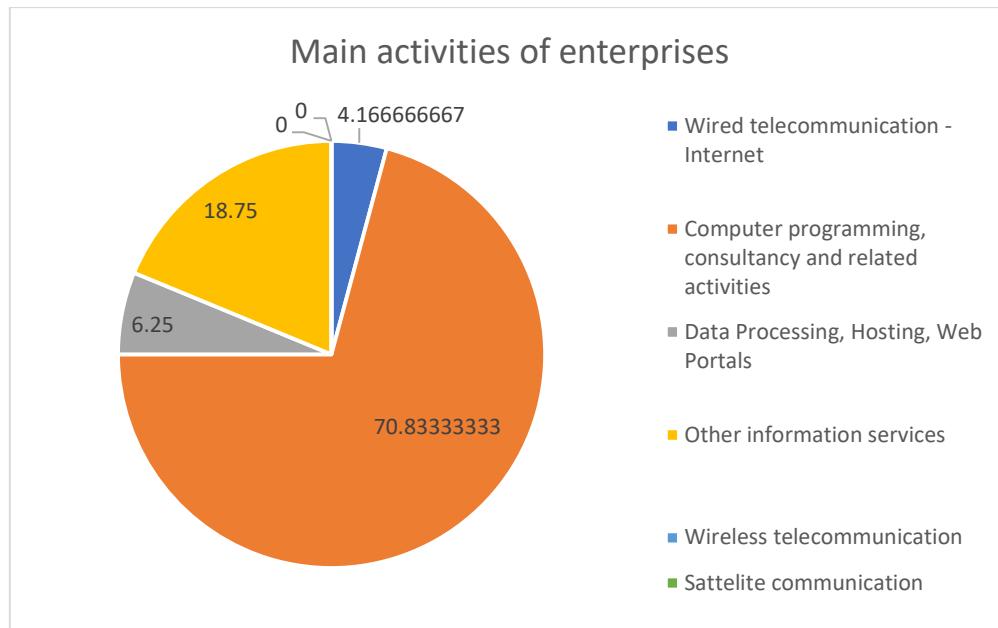


Fig.2 – Distribution of main activities of surveyed enterprises

If we consider main activities of surveyed enterprises, Fig.2 indicates that up to 75% of companies works in field of software, 18.75% of them operate in other information services such as game, computer maintenance, web-based recruitment...The number of enterprises operating in the field of data processing, web port, hosting accounted for 6% and companies have activities related to wired telecommunication and internet service provider occupy about 4.2%. These analytical data show that most ICT company in Hanoi works in the software industry and number of internet service providers is just a few. This is good agreement with the WP1 report where number of software enterprises increase of 29.4% in the year 2018 compared to the year 2017 and in line with the reality in Ha Noi where there are four internet service providers such as Viettel, FPT, VNPT and Netnam, VTVcab.

### 3.2 Staffing of the surveyed enterprises

Among the surveyed enterprises, enterprise with the number of employees from 200 to 500 account for majority of 46%, accounting for 20% are enterprises with fewer than 200 employees, and 12%, 10% are enterprises with number of employees less than 50 and 10 people, respectively. This statistical data is depicted in Fig.3. This statistic says that most SME ICT enterprises have number of employees of several hundred people.

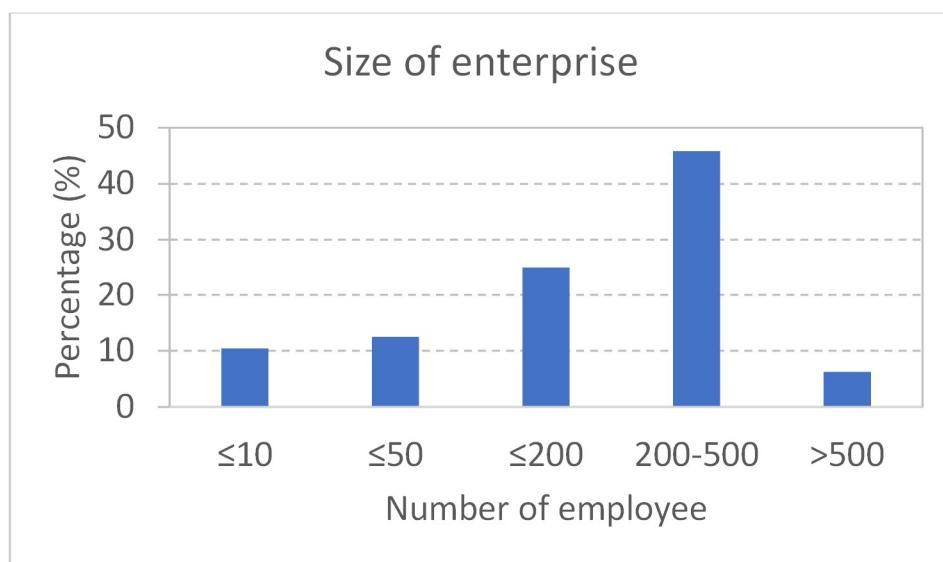


Fig.3 – Size of enterprises by number of employees

To see more clearly the hired-labor characteristics of ICT company, let's take a closer look at the staff statistic. As seen in Fig.4, the percentage of female employees in enterprises averages about 34%, and the largest average is about 75%. Most of companies signed the fixed-term contract with employees, the indefinite-term contract with the experienced people, seniority, founder or co-founder members. Short-term contract accounts for 20% in average or maximum to 45% at some companies when they need labor forces at busy periods to finish projects.

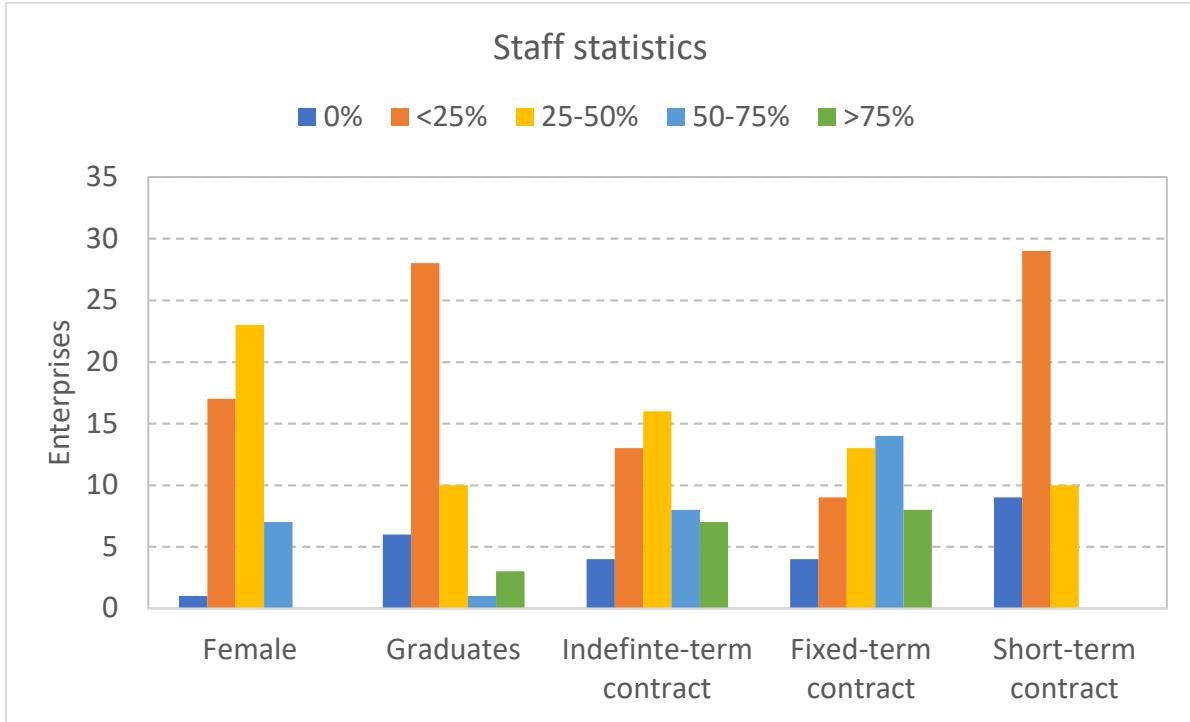


Fig.4 – Characteristics of hired labors

Many surveyed enterprises said that they have used freelancer for their company. Among 48 interviewed enterprises, there are 58.81% of them accepted freelancers to work for them. The main areas where companies hire freelancers are jobs related to IT, software as shown in Fig.5. Software engineer and IT engineer are top two freelancer jobs hired. Other jobs are also hired by enterprises related to unskilled jobs and other than IT.

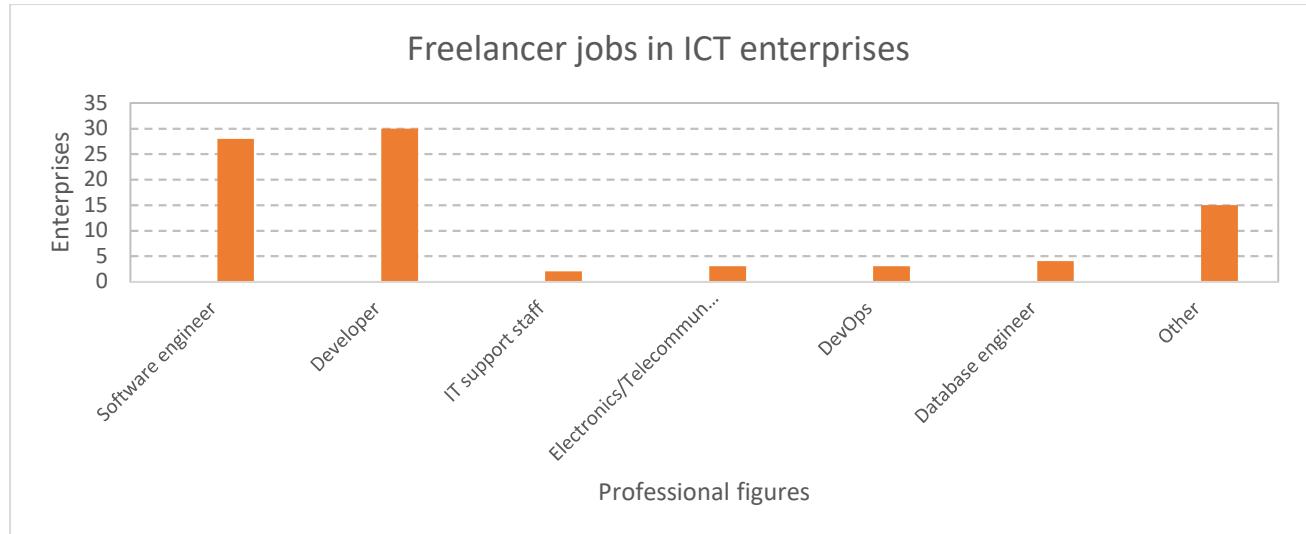


Fig.5 – Distribution of freelancer job used in ICT enterprises

A highlight in the ICT sector is that students studying in universities or colleges are easy to apply for internships in companies. 40 out of 48 interviewed enterprises (83%) answered that

they accept internship students. Table 6 shows list of majors for internship is often recruited by companies.

**Table 6 – Internship's majors in ICT company**

Majors	Enterprises	Majors	Enterprises
Developer	27	Database engineer	21
Electronics/Telecommunications Engineer	3		
Software engineer	40		
Multimedia staff	3		
Tester engineer	18		

For the university trainee currently employed in companies, the statistical collected data shows that there are about 83% enterprises having them work.

The courses of study of the university trainee programming, network security, electronics and telecommunications, information technology, data mining/analysis, computer science, mobile application.

### 3.3 Recruitment situation of the surveyed enterprises

**Question: In the last calendar year (i.e. 2020), how did the Company's activity go in relation to the set goals?**

Fig. 6 describes indexes to show their operations. 31.25% companies said it was better than expected, 54.16% companies obtained their goals approximately. Just only 8.33% companies didn't achieve the set goals. This proves that ICT companies have positive development during Covid-19.

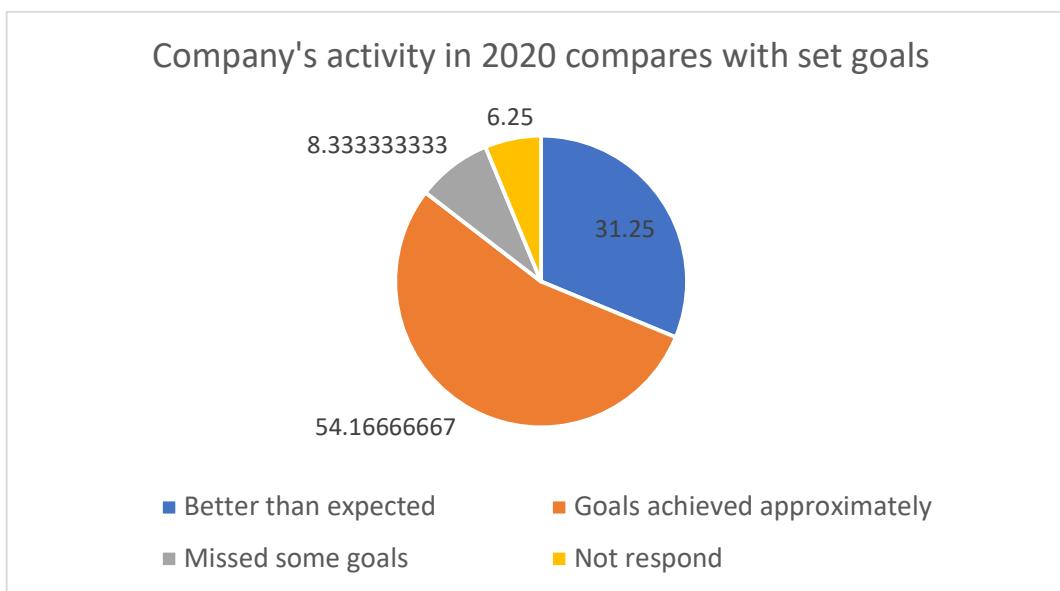


Fig.6 – The business situation of companies in 2020

**Question: During the last 12 months, has the company hired staff (even for turnover only)?**



Fig.7 – The situation of staff hiring of companies in 2020

Looking at Fig.7, we can see that the recruitment situation of ICT companies is still very good even though the year of 2020 Hanoi was much affected by Covid-19 pandemic. As shown in Fig. 7, up to 91% of businesses recruit more employees, only 2% of companies do not recruit more employees because that company provides internet services for 5-star hotels but due to Covid-19 there are no customers using the service. This statistical data proves that ICT companies is fast development in the Covid-19 period.

**Question: How many hirings have you made in the last 12 months and for which professional?**

Professional figures that employed for the last 12 months of the year 2020 of surveyed enterprises is listed in Table 7.

**Table 7 – Last 12 months recruited professional figures**

Professional figures	No of hiring	No of enterprises
Software engineer	~900	40
Software architect	~30	12
Developer	~500	32
Tester engineer	~400	35
Business analyst	~100	12
Electronics/Telecommunication engineer	~500	3

From table 7, it is said that software engineer and tester are top recruitment needs. Therefore, ICT students in recent years have high competition for the entrance examination but they can get jobs immediately after graduation. Fig.8 shows that about 90% of companies recruited fresh graduate student.

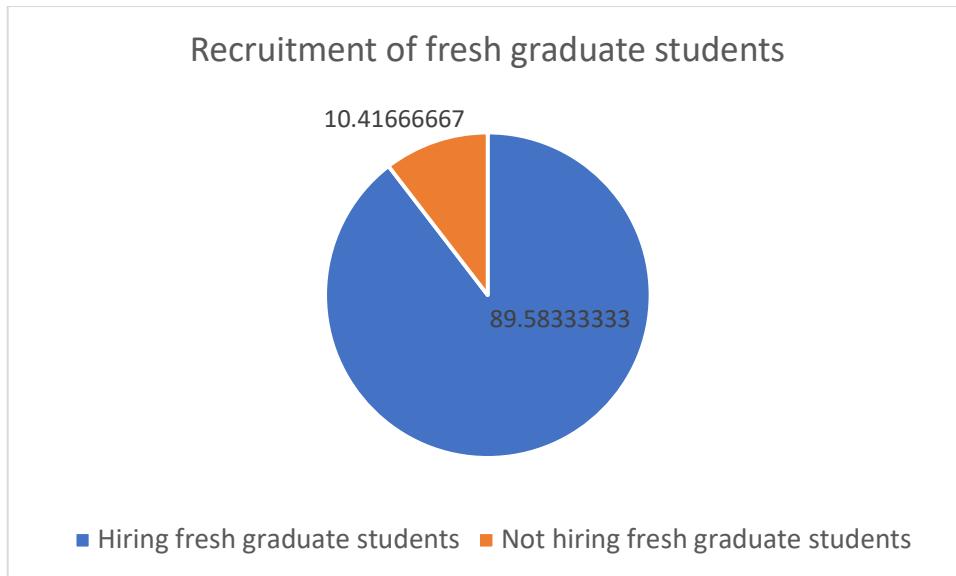


Fig.8 – The situation of staff hiring of companies in 2020

**Question: How many new hirings (even for turnover only) have a degree and what degree is it?**

The answer for this question is shown in the Table 8.

**Table 8 – Number of new hirings and its degree**

Degree in	No of new hirings
Computer science, engineering	~1800
Software engineer	~1900
Software architect	~100
Tester engineer	~1267
Banking, System engineer (Business analyst)	~200
Database engineer	~900
Electronics/Telecommunication engineer	~300

The number of new hiring reported in Table 8 indicates that the demand for software engineer, information technology engineer, and tester is very high.

**Question: Do you think that, over the next 2 years, the Company will hire staff (even for turnover only)?**

Recruitment projected in the next two years (as from 2020) even for turnover only is depicted in Fig. 9. It is easy to recognize that the future recruitment plan of ICT businesses still grows up. 83% of companies asked will continue to recruit more employees in next two years. No business plans to cut staff or not hire.

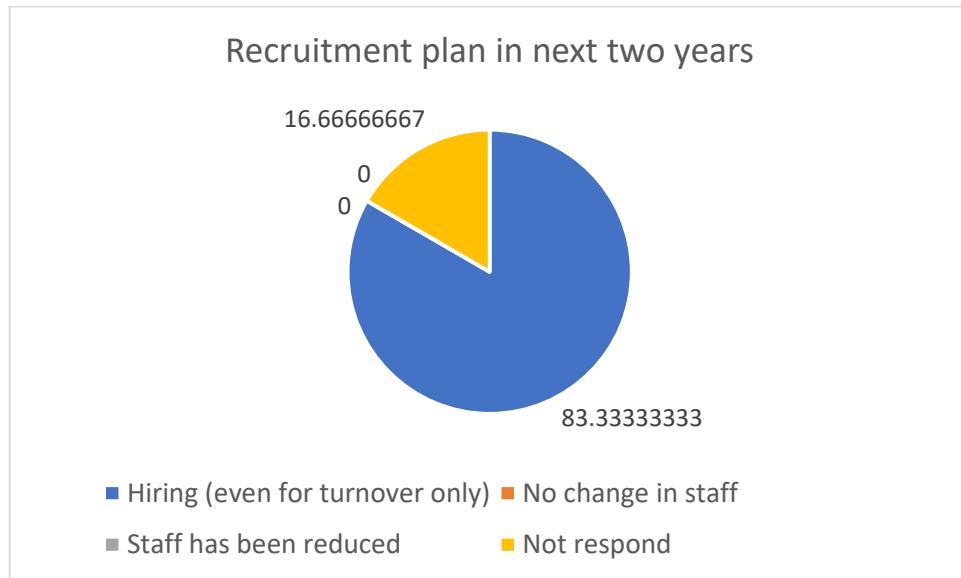


Fig.9 – Future plan of staff hiring in next two year.

Answering the question if the company will hire staff (even for turnover only), how many hirings are expected and for which professional figures, enterprises all want to recruit personnel in the next 2 years. However, they face some difficulties in recruiting staff. Fig.10 shows the information to indicate the reason of difficulty in recruiting.



Fig.10– Reasons of recruitment difficulty

With the question for which professional figures do you have more difficulties?

The answer for this question is indicated in Table. 9

**Table 9 -Difficulty of recruitment is shown in some professional figures below**

Professional Figures	No of enterprises	Percentage (%)
Business analyst	10	20.83
Database engineer	20	41.67
Software engineer	37	77.08
Software architect	13	27.1
System analyst	17	35.42
Security analyst	21	43.75
Electronics/Telecommunication engineer	9	18.75
DevOps	33	68.75

**Question: From your point of view, how will the economic trend of the ICT sector evolve in the coming years?**

Most of company (98%) believe the economic trend of the ICT sector has positive growing in the coming year. This answer shows that the signal for ICT enterprises grow in coming years is very reliable.

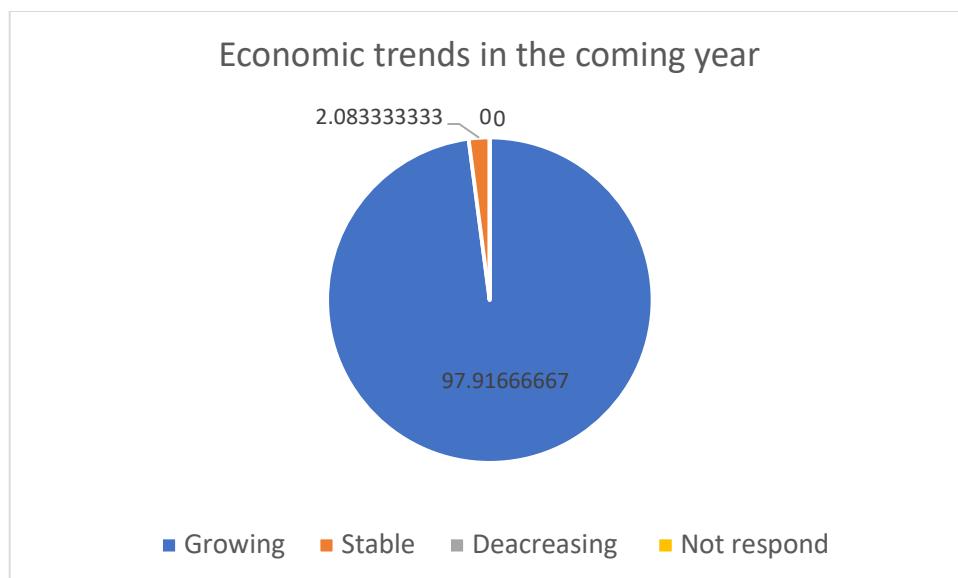


Fig.11 – Economic trend of ICT sector in the coming year

**Question: In your opinion, which professional figures will have the best employment prospects in the ICT sector in the coming years?**

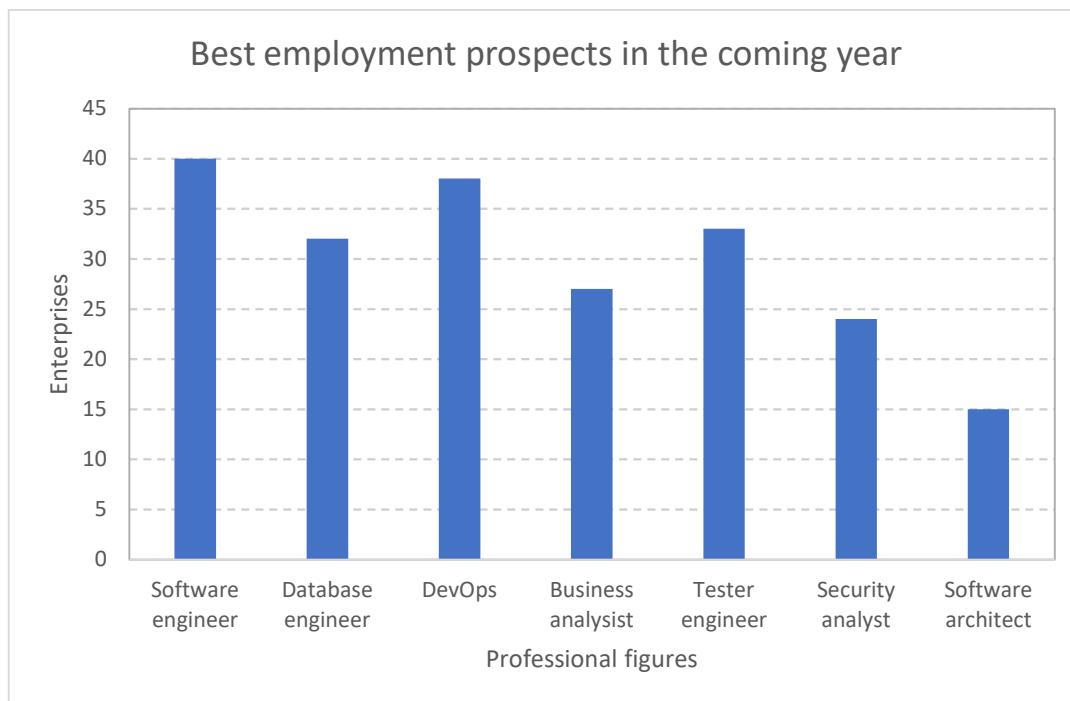


Fig.12 – The most employed-professional figures

As we can see the graph in Fig.12, professional figures will be recruited most are software engineer, database engineer, DevOps, business analyst and tester engineer, security analyst.

### 3.4 Business results and future directions of the surveyed enterprises

**Question: If 100 is the number of your clients, how many of them (in percentage) come from Ha Noi city, other Provinces and/or from foreign countries?**

The answer for this question is shown in Fig. 13 by the distribution of clients of enterprises. For example, with clients from Ha Noi, 15 companies have number of clients smaller than 25%, 8 companies have no client from Ha Noi (0%). With clients from foreign country, 8 enterprises have 100% foreign clients.

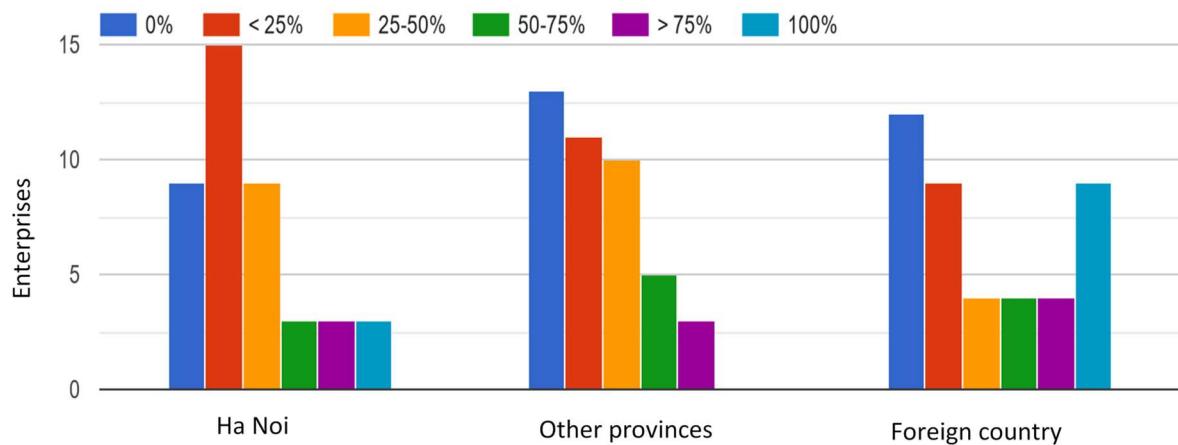


Fig.13 – Distribution of clients of enterprises

**Question: Which is the percentage of revenue deriving from collaborations with foreign clients?**

The percentage of revenue deriving from collaborations with foreign clients is indicated in Fig.14. Among 15 enterprises answered the above issue, there are 10 enterprises provided information and 5 enterprises did not give any data.

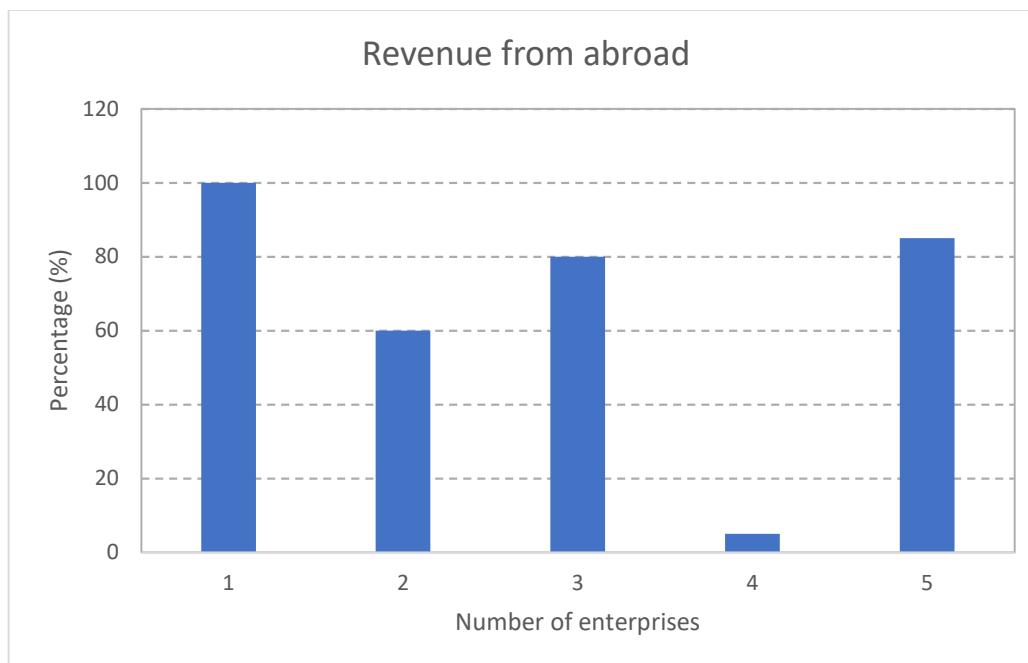


Fig.14 – Statistical data with revenue from abroad

## 4 Organizational structures and professional figures

### 4.1 Types of organizational structures

Since the surveyed enterprises are SMEs the internal organizational structure of these enterprises is quite similar for company size of about 200-300 employees, but the name of each functional department may be different. Fig.15 describes the organizational structure of software enterprise at medium size.

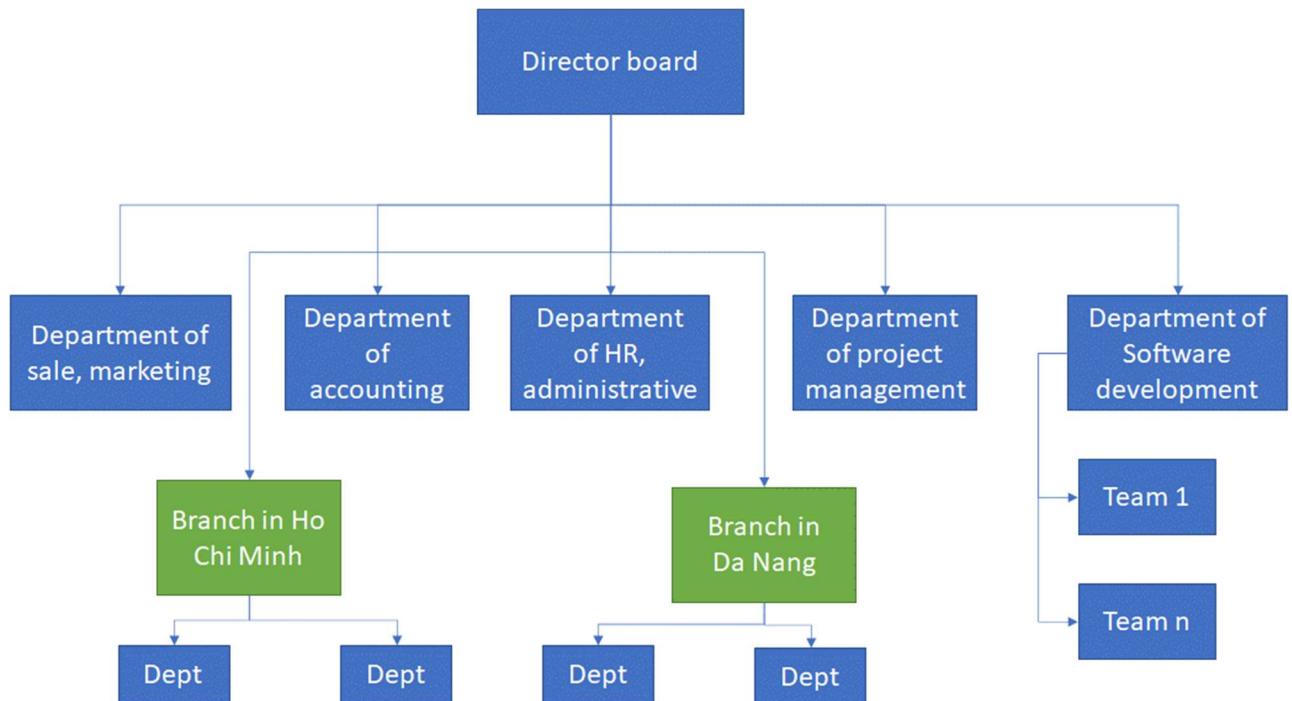


Fig.15 – Typical internal organizational structure of software enterprises

Its organization includes head office in Ha Noi and branches in Ho Chi Minh or Da nang city under supervised of Director board with director and several deputy directors. The head office has more functional departments than branches. Chief accountant works in the department of accounting at the head office. The head office divides into separated functional departments. Sale, marketing works belongs to a sale and marketing department. Accounting department has number of staff under the managed of a chief accountant. Department of project management manages, controls and distributes projects to software development department to implement projects with engineers in different teams who work on specific project.

For the enterprises who do not outsource or produce software but operate web-service, or internet services, or IT services, their organizational structures are somewhat different in several functional department. Instead of having software development department, it has department of technique and department of system operation. Staffs in the technical

department normal deploys system at the service sites meanwhile the staffs belong to department of system operation will maintain the operation of system remotely or onsite.

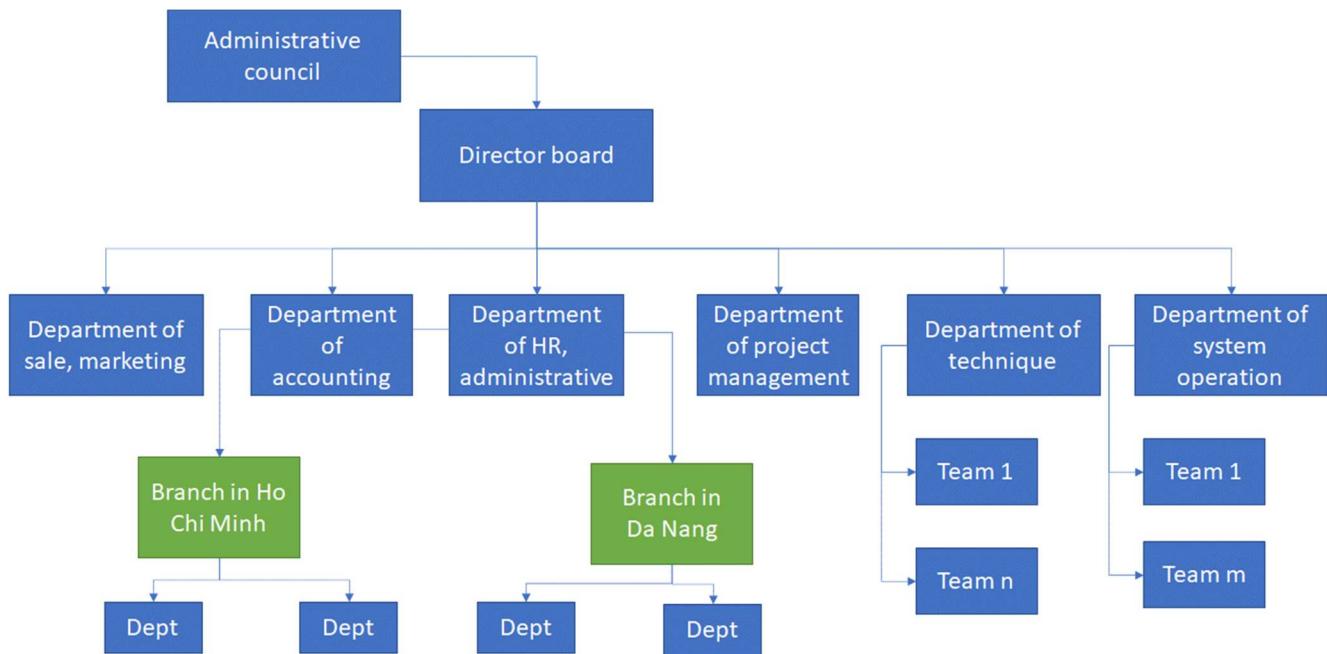


Fig. 16 – Typical internal organizational structure of IT service enterprise

With the company has smaller number of employees from 10 to 100, many functional departments are combined into one department. Normally, function of HR, administrative and accounting are put in one department with each professional person manages a specific function. In this type of enterprise, director manages all departments. The organizational structure of small enterprises is shown in Fig. 17.

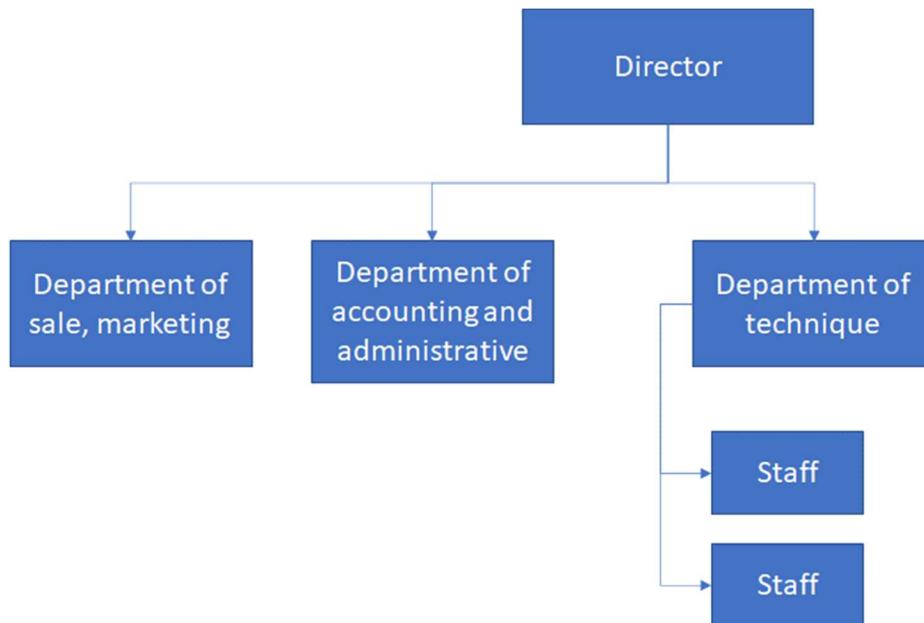


Fig. 17 – Typical internal organizational structure of small ICT enterprise

## 4.2 Professional figures

About the professional figures of ICT companies, there are so many types of professional figures. In order to figure out specific professional figure, we arrange professional figures into two large function areas which is area of technical section, and manager level.

Fig.18 depicts data on professional figures in technical section working at the interviewed companies

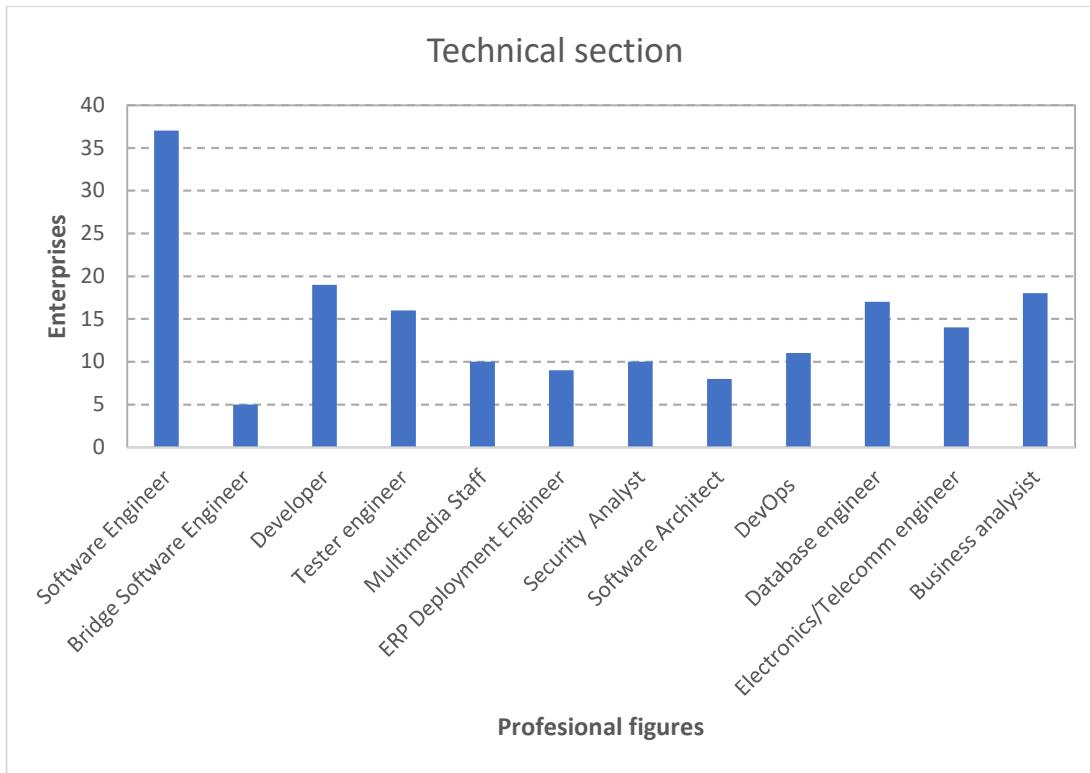


Fig. 18 – Professional figures in the technical section that enterprises recruited

In the technical sections, it mainly consists of many professional figures such as:

1. Software engineer
2. Bridge software engineer
3. Developer
4. Tester engineer
5. Multimedia staff
6. ERP Deployment Engineer
7. Security Analyst
8. Software Architect
9. DevOps
10. Database engineer,
11. Electronics/Telecommunication engineer
12. Business analyst

Fig.19 describes professional figures working in the sale section of surveyed companies.

In the sale section, some professional figures are required such as sale engineer, digital marketing.

Fig. 19 shows the professional figures of manager level who work in surveyed enterprises.

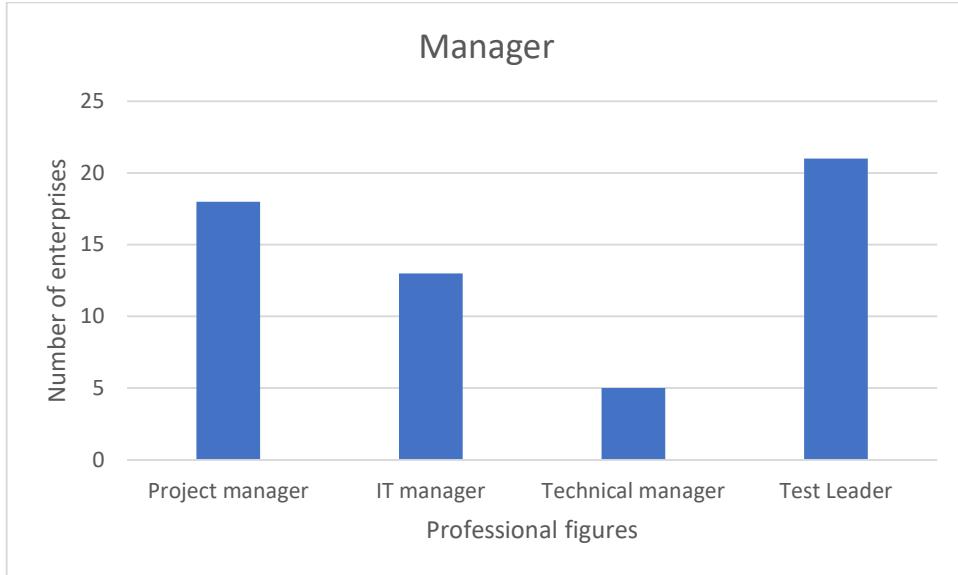


Fig. 19– Professional figures of manager level

In the manager level, it generally needs Project Manager, IT Manager, Technical manager, Test Leader.

Now, we see the characteristics of these professional figures

#### 4.2.1 Software engineer

The job of a software engineer is to apply mathematical analysis and principles of computer science to the design and development of one of following software such as computer software, smartphone software, operating systems, computer games, middleware, business applications, and network control systems.

#### **Responsible**

- Identify software products, analyze customers' needs or desires for those products to develop or improve or upgrade systems and software in accordance with customer needs.
- Develop and refine models and simulations to further develop requirements.
- Design, install, configure, program, and merge data.
- Write manuals for users or partners
- Gather Testers' feedback to fix software bugs if any.

## **Requirements**

- Bachelor or master's degree, major in computer science, electrical engineering, mathematics, physics, statistics and data science
- Have a good background in technical fields related to Computer Science such as Math, Physics, Logic bool, computer architecture, Probability statistics, etc.
- Good knowledge of Object-Oriented Programming and one of the languages C/C++, Java, C#, Python, Javascript, ReactJS, Angular, VueJS...
- English skill should be mid to high.

### **4.2.2 Bridge software engineer**

A bridge engineer (BrSE) is the person responsible for connecting the "home team" with the customer, ensuring that the two sides understand each other, and the cooperation is smooth and convenient. He/she must follow the project from start to finish, must know everything to be able to respond promptly.

## **Responsible**

- Acting as a bridge between Japanese customers and the project's Offshore team. Working directly with Japanese customers: analyzing project requirements, communicating work content to the project development team in Vietnam.
- Firmly grasp project information, project progress, arising in the project to conduct direct communication with customers
- Planning, monitoring progress, managing project members, reporting project progress to the Board of Directors and customers.
- Working in Vietnam or Japan.

## **Requirements**

- Experience in a BrSE position or equivalent.
- Minimum N2 Japanese, good communication and experience in compiling Japanese documents.
- Experience working with at least one of the programming languages: Java/PHP/JS (Nodejs, Vuejs, React Native..)
- Good communication, persuasion, negotiation skills.
- Understanding Japanese culture and working style is an advantage.

### **4.2.3 Developer**

Developers are people who rely on programming languages to design and maintain computer programs. Software Developer will be an expert in at least one programming language. Furthermore, they are key players in the development of software applications.

## **Responsible**

- Meet customers and analyze customer needs
- Design different pieces of software and let them work together to visualize how the software will work.
- Directly work with other departments to pass it on to programmers and coders so that they can develop products more fully. When needing opinions from Software Developer, they still need to be present to convey enough information about the product as well as customer needs that Software Developer wants the product to meet.
- Follow up to update or improve product features so that when applying the product into practice, the best effect is achieved.

## **Requirements**

- Good background in Computer Science, especially with Data Structures & Algorithm
- Programming and writing code.
- Design and organize information.
- Software search and debugging.
- Testing the software, ensuring the software runs smoothly and meets the requirements.
- Proficiency in Java, with a good understanding of its ecosystems
- Basic Understanding of the concepts of MVC (Model-View-Controller) Pattern, JDBC (Java Database Connectivity), and RESTful web services
- Worked extensively with MySQL, Redis.
- Markup Languages such as XML, JSON
- Good experience with Linux-based OS.
- Ability to read and understand English documents for work.

### **4.2.4 Tester engineer**

Tester engineer is a person responsible for testing a new product, a new feature, or the availability or quality of a project to find bugs, errors... or any other problem that the end user, customer may encounter. He/she provides reports to the project development team on any product improvement issues

## **Responsible**

- Reviewing software requirements and preparing test scenarios.
- Creating and executing test cases for the features of new projects / platforms you take responsibility for.
- Creating and executing test scripts.
- Analyzing test results on database impacts, errors or bugs, and usability.
- Preparing reports on all aspects related to the software testing carried out and reporting to the design team.
- Interacting with leaders to understand product requirements.

- Participating in design reviews and providing input on requirements, product design, and potential problems.

### **Requirements**

- Minimum 2 years' experience as a Software Tester.
- Ability and experience in creating test scripts.
- A bachelor's degree in computer science or related field.
- Up-to-date knowledge of software test design and testing methodologies.
- Working knowledge of programming.
- Good organizational skills and detail-oriented mindset.
- Experience testing blockchain applications is a plus.

#### **4.2.5 Multimedia staff**

Multimedia staff is person who applies information technology in the creation and design of multimedia products (running on many different terminals). A beautiful advertising sign, a blinking animated banner on the website background, an intro clip advertising an item that is about to be launched... are the products of Multimedia.

### **Responsible**

- Responsible for the successful delivery of creative assets to make the brand powerful from 2D designs (logos, key visual, concept visualization, POSM, website, newsletter ...) to the static & motive graphics, videos for various digital/social platforms and ad formats
- Ensure final graphics and layouts are visually appealing and on-brand.
- Participate in brainstorming to develop ideas and design direction.
- Actively contribute creative ideas for campaigns' concepts.
- Present ideas and designs to the internal team and/ or Client for approval.

### **Requirements**

- Bachelor's degree or Diploma in Design, Fine Arts or a related field.
- At least 1+ years of experience in Graphic Design.
- Proficient with After Effects, Illustrator and Photoshop.
- Ability to work in a fast-paced setting under tight deadlines.
- Good English communication and reading comprehension is a plus.

#### **4.2.6 ERP Deployment Engineer**

ERP deployment engineer is a person who deploy solutions and software to connect user needs with system functions to concentrate work between departments and departments together, creating a transparent information flow which aims to optimize enterprise resources.

## **Responsible**

- Evaluate user requirements for the system.
- Design and provide solutions to the appropriate requirements from users.
- System implementation: training and user training.
- Work directly with the vendor to implement project with the right quality, deadlines and user requirements.
- Do the configuration, perform the testing when a new entity is set up or new function is released
- Update release strategy when organization strcuture changes

## **Requirements**

- Degree preferably in an analytical field (such as Business, Economics, Psychology, Computer Science, Mathematics, Statistics or Finance)
- 2 years of experience for ERP supporting
- Experience in configuration and testing of ERP functions
- Good at English writing and speaking skills
- Good communication and business relationship skills, including the ability to explain technical concepts to non-technical employees

### **4.2.7 Security Analyst**

An information security analyst detects, investigates, and prevents attacks. They solve problems with technology such as software and IT equipment. Specifically, he/she installs firewalls, implement breach detection systems, and work with other professionals to resolve security-related issues. He/she also conducts security system audits and tests and analyze risks. He/she reports their findings and make recommendations to company executives.

## **Responsible**

- Design and propose, implement the security solutions to ensure the information security for IT system.
- Develop, review and support implementing the information security policies, standards and procedures.
- Manage and configure the security devices: NGFW, WAF to ensure the security for IT systems and endpoints.
- Implement, manage and monitor information security, analyze the security information and event, correlate to detect the threats, intrusion, data leakage, and report to management as well as immediately remediate the security incidents.
- Regularly conduct the security vulnerability scanning for the applications, servers, and network devices; propose and follow up with the security findings mitigation plan to ensure the vulnerabilities are fixed on time.
- Participate in IT projects and provide the security consultant to ensure the security

## **Requirements**

- Diploma / Bachelor's degree in IT
- At least 2 years working in IT Security
- Good at Microsoft Office, having experience with Power BI/ Power App would be an advantage
- Security+ or CEH qualification would be an advantage
- Strong knowledge of IT Infrastructure components: Firewalls-IPS/IDS, Network and network protocols, Windows (workstations and servers) OS/ Linux, and their security configuration.
- Strong knowledge of and have designed/implemented/operated the security systems: NGFW/WAF/Vulnerability Management/SIEM.
- Good knowledge of web and mobile applications and web/mobile application security.
- Work with vendors to conduct the Penetration Test for VAS IT systems and network; Analyze the test report and cooperate with related stakeholders to remediate the security findings.
- Good at security incident detection, analysis, and response, especially in emergent situation.
- Carefulness, good communication skills, good at negotiation to get the job done.
- Ability to work independently and in a team, withstand work pressure, accept business trips when required.
- High responsibility and enthusiasm, discipline, supportive mindset.
- Good English skill (written and verbal) is highly preferred

### **4.2.8 Software architect**

Software architect is person who design system architecture. Software Architect not only analyzes customer requirements (inside or outside the company) and then makes a system design but must closely monitor the Developer team when building the system, operating the system as well as when maintaining and expanding the system to ensure they follow the design correctly. Software Architect's work goes with project from start to the end.

#### **Responsible:**

- Working with product manager, engineering manager and other stakeholders to clarify and document platform requirements/specs (functional and non-functional)
- Accountable for defining & creating platform architecture model using modern software architecture, design patterns and solutions for high performance, high scalability, high availability, security, integrability and maintainability.
- Working with development team to implement platform core services/base framework. Provide and mentor platform architecture design documentation, coding standards, implementation guidelines, ensure high quality implementation/code quality for the development team.

- Ensures that all relevant project teams follow a common set of principles and patterns and utilize a standard set of technology frameworks and libraries
- Actively participate in technical approaches reviews and leading the team to solve technical issues, contribute and maintain software architecture design standards, base frameworks, coding standards, best practices, common libraries at company level.

**Requirements:**

- Bachelor's degree or equivalent in Computer Science, Information Technology. Master degree is an advantage
- Senior in software development and a minimum of 3 years of experience in system architecture design or technical team leader.
- Extensive hand-on experiences in defining software architecture models of large-scale software systems from scratch using UML, 4+1 Model, C4 Model
- Deep knowledge of common architectural patterns and service design (SOA, microservices, messaging, twelve-factor methodology, integration patterns...)
- Experience with programming languages: PHP, Python, JavaScript, Nodejs, C#, Java..., coding in RDBMS, NoSQL (MySQL/MariaDB, PostgreSQL, SQL Server, Redis, MongoDB, Cassandra, ES
- Experience in statistics, data mining, machine learning and operational excellence of production systems is a plus
- Experience establishing legacy modernization and migration roadmaps for large-scale applications.

#### 4.2.9 DevOps

DevOps is a new concept in software development life cycle. It combines product feature development and Operations of software simultaneously. More clearly, DevOps is a combination of principles, practices, processes, and tools that automate software development and delivery.

**Responsible:**

- Deploy, optimizing, monitoring, analysis the IT system operation
- Infrastructure design ensures scalability, reliability, high availability, performance, security
- Design and maintain monitoring and backup procedures and checklists
- Deploy components for automation test/performance test
- Monitor services and coordinate with development & operation team to handle when a problem happened
- Develop tools to increase visibility and productivity.
- Build production processes, deploy DevOps tools.

**Requirements:**

- Proficient in using Linux, Windows, and macOS.
- Know how to use Terminal commands in linux, CMD and powershell in windows and commands in Linux or Macos.
- Basic knowledge of: Process Management, Threads and Concurrency, Sockets, I/O Management, Virtualization, Memory storage and File systems.
- Knowledge about CI/CD (Jenkins, AWS CD);
- Knowledge about containers (Docker), K8S, Ansible.

**4.2.10 Database engineer**

In this Information Age, enterprises must deal with a massive amount of data, hence creating a need for data engineers who can collect and manage large quantities of data. Data Engineers build systems that collect, manage, and convert raw data into usable information so that organizations can use to evaluate and optimize their performance.

**Responsible:**

- Analyze customer requirements
- Design data warehouses
- Develop ELT tools and database pipelines
- Develop algorithms to transform data into useful information
- Create new data validation methods and data analysis tools
- Develop Business Intelligence system

**Requirements:**

- At least Bachelor's degree in computer science and information technology.
- Proficiency of common programming languages such as C#, Java, Python, R, Ruby, Scala and SQL.
- A good understanding of ETL (extract, transform, load) tools and APIs for creating and managing data integration jobs. Knowledge of relational and non-relational databases (NoSQL databases, Apache Spark, MySQL and PostgreSQL) and Unix-based operating systems (OS) such as Unix, Solaris and Linux. Being familiar with tools and frameworks for machine learning, deep learning, big data.
- Knowledge of cloud computing and data security is a plus.
- An experience in data engineering is often preferred.

**4.2.11 Electronics/Telecommunication engineer**

Telecommunications engineers design, construct, install and service telecommunications equipment and systems. Telecommunications engineers are often employed by major telecommunications providers or telecom equipment suppliers.

**Responsible:**

- Design, develop, test and install voice and data telecommunications networks
- Develop proposals and determine costs and timelines for telecommunications projects
- Test and implement new products and services
- Configure networks and interconnected systems
- Research, analyze and design system specifications
- Identify and solve issues with current network systems
- Monitor systems and identify needs for upgrades and enhancements

**Requirements:**

- At least Bachelor's degree in Electronic Engineering – Telecommunication;
- Knowledge of telecommunications systems such as mobile networks, telecommunication system, TCP/IP, radio transmission protocols.
- Knowledge of software for designing telecom networks and systems.

#### 4.2.12 Business analyst

A business analyst is a bridge between the customer and the development team. They are responsible for identifying, analyzing the customer requirements and transferring these into technical requirements that the development team can use for developing solutions. This position often requires knowledge and skills in IT and business.

**Responsible:**

- Work closely with the customer to identify, clarify and analyse the customer requirement
- Build various requirement specifications (user requirement specification, functional specification, system requirement specification, etc.), use cases, user stories
- Work with the development team to provide the solution proposal to the customer
- Support in testing, verifying bugs/issues with the customer

**Requirements:**

- At least Bachelor's degree in computer and information technology areas such as Information Technology, Information System. Degrees in business areas could be applicable.
- Knowledge of software development process, especially software requirement analysis and modelling languages and tools. Basic knowledge of programming, databases and testing techniques.
- General understanding business processes. Depending on a position, a specific business domain knowledge is a plus (banking, insurance, health care, human resources, etc.).
- For entry level, basic experience in developing or testing software is often required.
- For senior level, 3 or more years of experience are required.

#### **4.2.13 Project Manager**

The IT Project Manager will plan, establish, and manage information technology (IT) projects and will serve as a liaison between the business and technical aspects of assigned projects.

##### **Responsible:**

- Manages assigned IT projects to ensure adherence to budget, schedule, and scope of project.
- Develops, maintains, and revises proposals for assigned projects including project objectives, technologies, systems, information specifications, timelines, funding, and staffing.
- Sets and tracks project milestones; manages and accounts for unforeseen delays, then realigns schedules and expectations as needed.
- Establishes and implements project communication plans, providing status updates to affected staff and stakeholders.
- Collects, analyzes, and summarizes information and trends as needed to prepare project status reports.
- Performs other related duties as assigned.

##### **Requirements:**

- Bachelor's degree in Computer or Information Science-related field required; Master's degree preferred.
- At least three years of related experience required.
- Organized with attention to detail.
- Excellent analytical, logical thinking, and problem-solving skills.
- Excellent verbal and written communication skills.
- Thorough understanding of project management principles and planning.
- Thorough understanding of information technology procedures and practices.
- Proficient with, or able to quickly become proficient with, a range of general and specialized applications, software, and hardware used in the organization and the industry.
- Proficient with Microsoft Office Suite or related software.
- Ability to motivate groups of people to complete a project in a timely manner.

#### **4.2.14 IT Manager**

The main responsibility of IT Team Leaders is to lead and coordinate their teams to achieve the goals set by the senior management. They oversee the day-to-day functions of their teams to make sure their activities on track. They also train and guide junior staff so that they can be equipped with new knowledge and skills required for their jobs.

**Responsible:**

- Carry out administrative functions
- Plan team activities
- Give direction and guidance to team members
- Coordinate the work of team members
- Coordinate with other teams and departments
- Coach and mentor team members
- Report to the senior management

**Requirements:**

- At least Bachelor's degree in ICT. A degree in business and management is an advantage;
- Depending on the technical nature of their teams, a possession of comprehensive knowledge
- and technical skills in a certain technical field (software, testing, database, security, networking, cloud computing, IT solutions, etc.) is required.
- Soft skills such as communication, negotiation, organisation, leading and motivating are also required.
- Experience is required.

#### 4.2.15 Test Leader

Tester Leader is person who has the role of managing and supervising the testing team that they are assigned to manage. In addition, he/she also take on the task of assigning work, giving tasks and directing their team members to complete the tasks assigned by their superiors. From there, to ensure the completion schedule and product quality before handing over to customers.

**Responsible:**

- Proactively develop test cases
- Make test strategy and plan
- Lead the team to execute test cases.
- Good control of test errors
- Report software testing progress to upper management
- Know the test end time
- Improve testing process

**Requirements:**

- Bachelor's degree in computer science / engineering or equivalent practical experience

- 5+ years of experience in the creation and automation of SW tests (eg. regression, functionality/non-functionality, and API)
- Knowledge on the Python and testing tools: debug tools, CI/CD tools, test automaton framework
- Understanding for developer testing and agile testing
- Good communication skill in English, mostly for the technical communication with the collaborating scrum teams

#### 4.2.16 Technical manager

Technical Manager is the person responsible for the management and operation of the technical department. This is a position holding a leadership role in engineering and technology in enterprises. He/she possesses a high level of expertise in the technical field, so they can take care of the technical and technological development tasks of the business.

#### **Responsible:**

- Manage professional and technical issues in the business
- Human resource management in the department
- Consulting and advising on technical issues for the Board of Directors.
- Proposing and recommending new and suitable technical technologies for enterprises.
- Assist the board of directors in making technical selection decisions.

#### **Requirements:**

- Bachelor's degree in computer science / engineering or equivalent practical experience
- 5+ years of experience in the creation and automation of SW tests (eg. regression, functionality/non-functionality, and API)
- Depend on technical majors, it requires deep specific knowledges
- Good communication skill in English, mostly for the technical communication with the collaborating scrum teams

## **REFERENCES**

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2. Vietnam IT Market report – Tech Hiring 2022, Topdev

## Appendix – Cover letter sent by email to enterprises for participating survey

 **LAB-MOVIE**  
LABOUR MARKET OBSERVATORY  
IN VIETNAM UNIVERSITIES



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**THƯ MỜI THAM GIA KHẢO SÁT**

**Kính gửi:** .....

Trường Đại học Công nghiệp Hà Nội xin gửi lời chào trân trọng đến Quý công ty, cảm ơn sự giúp đỡ và hợp tác của Quý công ty trong thời gian vừa qua!

Dự án Nghiên cứu, quan sát và đánh giá thị trường lao động tại các trường Đại học Việt Nam gọi tắt là LAB-MOVIE do Châu Âu tài trợ thông qua chương trình ERASMUS+. Mục tiêu của Dự án là thiết lập công cụ trên nền tảng Web cho phép các trường đại học thu thập, xử lý thông tin về thị trường lao động nhằm cung cấp thông tin hữu ích cho sinh viên, kết nối việc làm với doanh nghiệp. Đồng thời giúp các trường đại học điều chỉnh chương trình đào tạo đáp ứng yêu cầu thực tiễn của doanh nghiệp.

Trường Đại học Công nghiệp Hà Nội là thành viên của Dự án LAB-MOVIE tham gia trong lĩnh vực Công nghệ thông tin và truyền thông (ICT). Nhà trường phụ trách việc “*Khảo sát, thu thập phản hồi của doanh nghiệp ICT về đánh giá năng lực nhân sự tốt nghiệp đại học cũng như xu hướng tuyển dụng trong giai đoạn tới*”.

Để có được các thông tin phục vụ Dự án, Nhà trường trân trọng kính mời Quý công ty tham gia trả lời khảo sát (*nội dung phiếu khảo sát tại file đính kèm*), cụ thể như sau:

- Thời gian đề xuất: .....
- Hình thức: tại công ty hoặc trực tuyến, hoặc trả lời khảo sát qua google form
- Thành phần: 02 cán bộ nhà trường

Thông tin chi tiết xin vui lòng liên hệ Ms Thảo, di động 0972892250, email: thaontp.hau@vnu.edu.vn

Nhà trường xin trân trọng cảm ơn./.

**Hiệu trưởng**   
  
