

Organizational behaviour and knowledge-sharing practices for open innovation within software companies

Professor: Fabiano Armanilli

Student: Pablo Gómez Blázquez

Montréal, March 13rd 2022

Contents

1 Introduction.....	3
2 Methodology.....	5
3 Results	7
4 Discussion.....	17
5 Conclusions.....	21
6 Bibliography	22

1 Introduction

This article aims to study the aspects related to innovation in software companies in Canada, for this purpose we have mainly differentiated the following points to be considered within innovation as such: the development of innovation; the aspects related to the company and co-workers; knowledge, its registration, transformation and treatment and; the aspects related to the choice of partners when assessing their suitability.

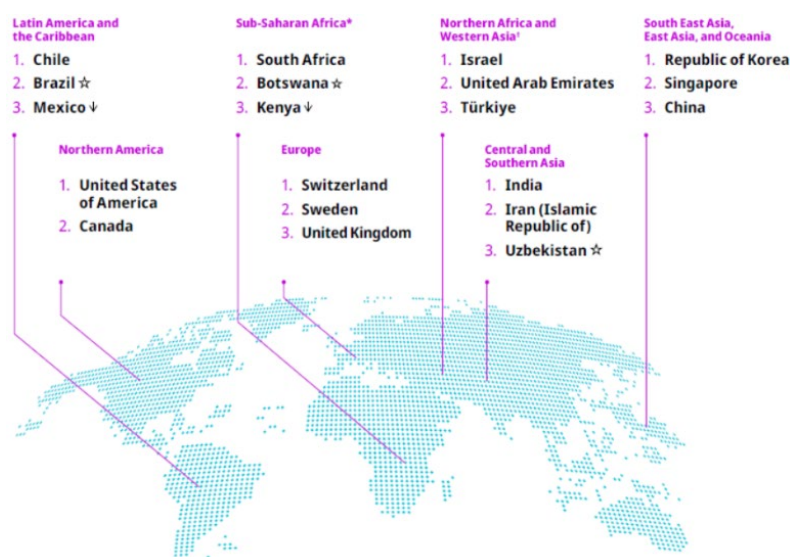
Before entering into the object of the study, it is convenient to provide a first definition of the term innovation. Innovation can be defined as a process involving multiple activities to discover new ways of doing things.

On the other hand, it is important to bear in mind the growing importance of innovation. At a time when competition among companies is increasing and the need for differentiation is seen as the only solution to this situation, innovation plays a fundamental role. Moreover, such innovation and its effect on companies depends on several factors which must be identified and evaluated.

Therefore, the most relevant tasks of the following study are related to the identification of the factors to be evaluated, the methodology used for data collection, the search criteria of the different profiles from which we want to collect data and the subsequent results, which will allow us to draw conclusions. It is essential to carry out any of these tasks in a precise manner, as they are interconnected, the results of any of them depending on the previous ones.

Given that the geographical framework of the study focuses on Canada, it is important to put the situation of innovation in this country into context within the world geography. To do so, we will analyze the World Innovation Index of the World Intellectual Property Office, which is a clear reflection of the innovation situation of the different countries and which is published annually.

Figure 1. Top three innovation economies by region.



Source: Wipo.

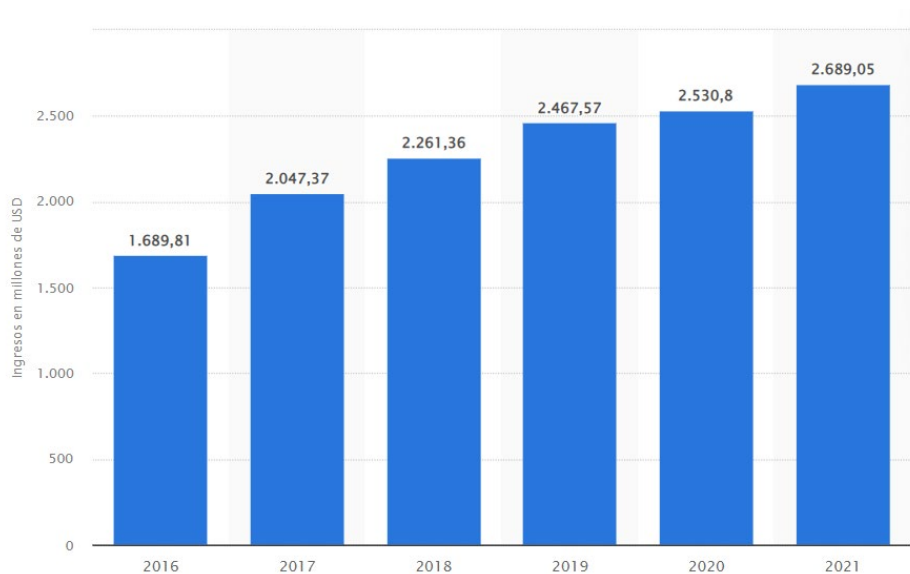
Therefore, analyzing the latest edition of the year 2022, it can be seen that Canada ranks 15th, behind the following countries: Switzerland, United States, Sweden, United Kingdom, Netherlands, Republic of Korea, Singapore, Germany, Finland, Denmark, China, France, Japan and China (2). In addition, other emerging economies such as India and Turkey make it into the top 40 for the first time.

The world's top R&D spenders increased their R&D spending by nearly 10% in 2021 to more than \$900 billion, up from 2019, the year before the pandemic. This increase is mainly attributable to four sectors: ICT hardware and electrical equipment; software and ICT services; pharmaceuticals and biotechnology; and construction and industrial metals.

It can therefore be concluded that the software sector, both globally and in Canada, is one of the main drivers of innovation growth.

Regarding the revenue of the software industry in Canadian companies, the following statistics made in 2020 are shown, where the period from 2016 to 2021 is shown, in millions of dollars. In 2016, the market revenue amounted to \$1,689.8 million. For its part, the estimated value of revenue for 2021 is 2,689.1 million.

Figure 2. Revenue of the software industry in Canadian companies.



Source: Statista.

2 Methodology

After defining the factors related to the innovation to be studied, the methodology to be followed for obtaining the necessary data and its subsequent analysis is defined. For this purpose, it is concluded that the most efficient and easiest way to obtain the greatest number of data is through a survey, which is aimed at a defined worker profile.

This survey is carried out in the tool "LimeSurvey", a tool that allows to carry out anonymous surveys online and in a simple and fast way.

The survey can be answered in English or French and is aimed at people who are working in Canada in companies related to innovation, mainly in Software. The main positions within the companies mentioned are the following: "Software Engineer", "Product Owner" and "Scrum Master".

The search is carried out through LinkedIn, by means of a filtered search by the requirements to be met. That is to say, it is filtered by the location "Canada", by the sector "Software" and by keywords. Once the person who meets the requirements is found, he/she is contacted, explaining the study being carried out and asking him/her to fill in the survey with his/her own experience. In some cases where the user is open to help, he is asked to spread the survey among his colleagues in the company who meet the same requirements.

For a more detailed and accurate analysis, it will be desirable to get as many people willing to take the survey as possible, so the goal is to get at least more than 100 respondents.

The survey is anonymous and consists of 16 questions, some of which have a number of sub-sections. In addition, questions with different types of answers are combined. Some are answered with a yes/no option. In others, the respondent has to answer some statements with different ratings ranging from "Not important at all" to "Utmost Importance" or from "Strongly disagree" to "Strongly agree".

Finally, the respondent will find a series of questions about the role he/she plays in his/her company, the size of his/her business unit and the situation of his/her department within the company's organization chart.

The study focused on the different results obtained according to the profile of the respondent. For this purpose, the respondents were divided into three main profiles: Manager, Software Engineer and Developer.

Within the Manager category, the following profiles were included: Leader/Project Manager; Leader/Coordinator; Chief Technology/Information Officer; IT Director; and Development Director.

Within the Software Engineer category, the following profiles have been included: Software Architect; Software test engineer; Database administrator; Systems analyst; Data engineer; Security engineer; Development operations engineer and; Quality assurance engineer.

Within the Developer category, the following profiles have been included: Developer/programmer and; Front-end developer.

Once the data collection phase is completed, the analysis phase begins, carried out mainly in Excel, from which we can draw the main conclusions of this study.

To perform the analysis of the results, we start from the raw data of each of the surveys. All these data have been transferred to pivot tables in order to know how many respondents have voted for each of the options. With this information, a simple calculation is used to calculate the percentages of votes for each of the options. Then, by means of a decision matrix, taking the different percentages and assigning a scale to each of the options, the percentage of each option is multiplied with the corresponding assigned weight, obtaining the total calculation, which indicates that the higher it is, the greater the importance of this factor for the respondents.

In the case of the questions relating to the degree of importance of each of the factors on innovative development, the scale used was as follows:

I don't know / Not applicable: 0 points

Not important at all: 1 point

Little importance: 2 points

Average importance: 3 points

High importance: 4 points

Utmost importance: 5 points

In the case of the questions related to the degree of agreement with the statement, the scale used was as follows:

I don't know / Not applicable: 0 points

Strongly disagree: 1 point

Partly disagree: 2 points

Neither agree or disagree: 3 points

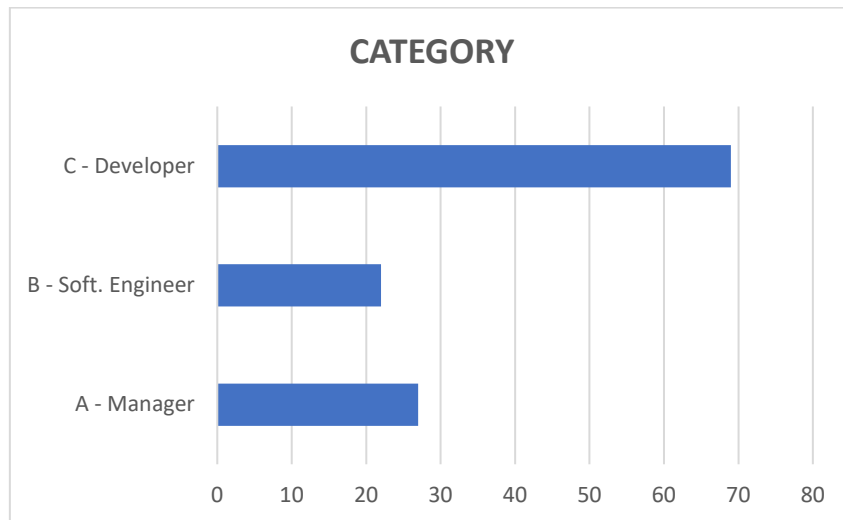
Partly agree: 4 points

Strongly agree: 5 points

3 Results

After the data collection phase, we have 118 completed surveys, which allow us to extract sufficient data to obtain the information for the study.

Figure 3. Number of people of each profile of the respondents.



Source: own.

The survey was completed by 27 people belonging to the Manager category, 22 people belonging to the Software Engineer category and 69 people belonging to the Developer category.

Of the total number of respondents, 74 of them claimed to have a position related to innovation and R&D, while 109 claimed to have a position related to software development and maintenance.

The survey consists of different parts and questions. First, it assesses the importance of a number of factors in the development of innovation in their respective companies over the past three years. The respondent has six options when evaluating each factor, from "Not important at all" to "Utmost important". They will also have the option of "I don't know/ Not applicable" for those factors that do not apply to them.

The results of this part of the survey are shown in tables differentiated according to the profile of the respondent. First, for respondents with Manager category, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 1. Importance of a number of factors in the development of innovation for the Manager category

Item	1 - Not imp. at all	2 - Little imp.	3 - Average imp.	4 - High imp.	5 - Utmost imp.	I don't know / Not applicable	Total Calculation
IP out-licensing	14,81	25,93	22,22	18,52	11,11	7,41	262,96
Contracted R&D services	11,11	22,22	33,33	25,93	7,41	0,00	296,30
Informal networking	0,00	14,81	29,63	29,63	22,22	3,70	348,15
Specialized open innovation intermediaries.	3,70	7,41	29,63	29,63	7,41	22,22	262,96
Supplier innovation awards.	22,22	18,52	18,52	22,22	7,41	11,11	240,74
University research grants.	29,63	7,41	22,22	22,22	11,11	7,41	255,56
Joint-venture activities.	3,70	18,52	18,52	33,33	11,11	14,81	285,19
Creation of spin-offs.	14,81	25,93	25,93	18,52	3,70	11,11	237,04
Corporate business incubation.	14,81	18,52	25,93	22,22	7,41	11,11	255,56
Selling market-ready products.	7,41	11,11	18,52	33,33	22,22	7,41	329,63
Participation in standardization (public standards).	11,11	18,52	3,70	37,04	14,81	14,81	281,48
Donations to commons or non-profits.	22,22	18,52	11,11	14,81	18,52	14,81	244,44
Customer & consumer co-creation.	7,41	11,11	18,52	40,74	14,81	7,41	322,22
Crowdsourcing.	18,52	14,81	14,81	22,22	11,11	18,52	237,04
Idea & start-up competitions.	14,81	11,11	18,52	25,93	18,52	11,11	288,89
Publicly funded R&D consortia.	14,81	14,81	18,52	25,93	7,41	18,52	240,74

Source: own.

Secondly, for respondents with Software Engineer category, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 2. Importance of a number of factors in the development of innovation for the Software Engineer category

Item	1 - Not imp. at all	2 - Little imp.	3 - Average imp.	4 - High imp.	5 - Utmost imp.	I don't know / Not applicable	Total Calculation
IP out-licensing	18,18	13,64	18,18	31,82	9,09	9,09	272,73
Contracted R&D services	18,18	18,18	18,18	31,82	9,09	4,55	281,82
Informal networking	9,09	18,18	27,27	22,73	18,18	4,55	309,09
Specialized open innovation intermediaries.	13,64	13,64	27,27	31,82	0,00	13,64	250,00
Supplier innovation awards.	18,18	13,64	18,18	36,36	9,09	4,55	290,91
University research grants.	9,09	18,18	18,18	13,64	18,18	22,73	245,45
Joint-venture activities.	18,18	9,09	22,73	22,73	9,09	18,18	240,91
Creation of spin-offs.	18,18	13,64	22,73	18,18	9,09	18,18	231,82
Corporate business incubation.	13,64	27,27	4,55	22,73	18,18	13,64	263,64
Selling market-ready products.	9,09	18,18	13,64	18,18	36,36	4,55	340,91
Participation in standardization (public standards).	4,55	18,18	9,09	40,91	22,73	4,55	345,45
Donations to commons or non-profits.	13,64	22,73	18,18	27,27	13,64	4,55	290,91
Customer & consumer co-creation.	0,00	18,18	0,00	59,09	18,18	4,55	363,64
Crowdsourcing.	13,64	18,18	18,18	18,18	13,64	18,18	245,45
Idea & start-up competitions.	9,09	36,36	18,18	13,64	13,64	9,09	259,09
Publicly funded R&D consortia.	18,18	27,27	9,09	9,09	4,55	31,82	159,09

Source: own.

Lastly, for the Developer category respondents, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 3. Importance of a number of factors in the development of innovation for the Developer category.

Item	1 - Not imp. at all	2 - Little imp.	3 - Average imp.	4 - High imp.	5 - Utmost imp.	I don't know / Not applicable	Total Calculation
IP out-licensing	5,80	11,59	8,70	13,04	23,19	37,68	223,19
Contracted R&D services	10,14	14,49	15,94	27,54	10,14	21,74	247,83
Informal networking	1,45	10,14	34,78	33,33	11,59	8,70	317,39
Specialized open innovation intermediaries.	7,25	17,39	20,29	15,94	11,59	27,54	224,64
Supplier innovation awards.	13,04	18,84	14,49	15,94	7,25	30,43	194,20
University research grants.	21,74	13,04	14,49	15,94	13,04	21,74	220,29
Joint-venture activities.	11,59	14,49	20,29	26,09	13,04	14,49	271,01
Creation of spin-offs.	15,94	13,04	17,39	15,94	11,59	26,09	215,94
Corporate business incubation.	11,59	18,84	14,49	20,29	11,59	23,19	231,88
Selling market-ready products.	2,90	11,59	7,25	28,99	42,03	7,25	373,91
Participation in standardization (public standards).	8,70	11,59	10,14	33,33	24,64	11,59	318,84
Donations to commons or non-profits.	8,70	21,74	20,29	23,19	8,70	17,39	249,28
Customer & consumer co-creation.	4,35	5,80	23,19	23,19	27,54	15,94	315,94
Crowdsourcing.	28,99	18,84	7,25	8,70	8,70	27,54	166,67
Idea & start-up competitions.	18,84	15,94	20,29	15,94	17,39	11,59	262,32
Publicly funded R&D consortia.	18,84	10,14	18,84	10,14	7,25	34,78	172,46

Source: own.

In the second part of the survey, the importance of a series of factors related with the team/company, is then evaluated. The respondent has six options when evaluating each factor, from "Strongly Disagree" to "Strongly agree". They will also have the option of "I don't know/ Not applicable" for those factors that do not apply to them.

First, for respondents with Manager category, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 4. Importance of a series of factors related with the team/company for the Manager category.

Item	1 Strongly disagree	2 Partly disagree	3 Neither agree or disagree	4 Partly agree	5 Strongly agree	I don't know / Not applicable	Total Calculation
To help others with work issues	3,70	0,00	0,00	25,93	70,37	0,00	459,26
To take initiative to do beneficial actions in favor of the company and coworkers	3,70	0,00	0,00	44,44	51,85	0,00	440,74
To take care for their psychological well-being	0,00	3,70	18,52	29,63	48,15	0,00	422,22
To try to participate in informal social activities promoted by the company and/or coworkers	0,00	3,70	11,11	51,85	33,33	0,00	414,81
To take initiative to register and storage information/knowledge they gather	0,00	3,70	7,41	59,26	29,63	0,00	414,81
To make informal comments on lines of code	3,70	7,41	7,41	44,44	29,63	7,41	366,67
To make formal documentation (e.g. UML diagrams) about the code they are working with	3,70	29,63	11,11	29,63	22,22	3,70	325,93
To register lessons learned from software projects and problem solving	3,70	22,22	3,70	37,04	29,63	3,70	355,56
To search for knowledge about new tools, technologies and trends in software development.	0,00	3,70	7,41	40,74	48,15	0,00	433,33
To incorporate new knowledge they gather externally in projects/ work routines.	0,00	11,11	11,11	37,04	40,74	0,00	407,41
To identify potential applications for our products/IP outside the corporate boundaries	3,70	22,22	18,52	37,04	14,81	3,70	325,93
To generate ideas based on distinct consumer insights, with a market-related approach.	0,00	0,00	25,93	40,74	33,33	0,00	407,41
To be able to describe professional or technical terms with conversational language to easy communication	0,00	0,00	0,00	59,26	40,74	0,00	440,74
To be encouraged to articulate and communicate what we have in mind	0,00	3,70	3,70	29,63	62,96	0,00	451,85
To be helped to articulate their ideas when they cannot express themselves clearly.	0,00	3,70	7,41	33,33	55,56	0,00	440,74
To use gathering opportunities to exchange knowledge informally, in a casual way	0,00	18,52	18,52	29,63	33,33	0,00	377,78
To convert the new knowledge they learn into effective actions for their work routines.	0,00	0,00	22,22	51,85	25,93	0,00	403,70

To use the new knowledge they acquire to understand context and motives behind real work situations	0,00	0,00	11,11	62,96	25,93	0,00	414,81
To use the new knowledge they learn to think about what improvements should be made in the work routine	0,00	0,00	11,11	51,85	37,04	0,00	425,93
To assess how the new knowledge they learn can be valuable to the work routine and for the interests of my company	0,00	3,70	22,22	44,44	29,63	0,00	400,00
There are well-defined norms and procedures to deal with knowledge, regarding its gathering, registering, sharing and use.	7,41	14,81	18,52	33,33	22,22	3,70	337,04
There is a well-defined infrastructure dedicated to storage and share the knowledge needed to perform work tasks, solve problems and to develop products.	0,00	14,81	7,41	18,52	55,56	3,70	403,70
Employees are properly rewarded for the knowledge contributions that they make	7,41	14,81	22,22	29,63	22,22	3,70	333,33
My company provides adequate physical spaces where employees can socialize and exchange knowledge	7,41	3,70	7,41	25,93	51,85	3,70	400,00
To have the technical abilities required.	0,00	0,00	0,00	29,63	62,96	7,41	433,33
To have relevant prior experience with similar projects.	0,00	0,00	3,70	29,63	59,26	7,41	425,93
To have high quality standards for work/project deliveries.	0,00	0,00	11,11	25,93	55,56	7,41	414,81
To have a strong sense of commitment towards partners.	0,00	3,70	3,70	29,63	55,56	7,41	414,81
To keep in touch continuously, providing feedback about projects' evolution.	0,00	7,41	3,70	25,93	51,85	11,11	388,89
To have a sense of ownership of the project, participating effectively.	0,00	0,00	3,70	22,22	66,67	7,41	433,33
To have a partner who strive for respecting rigorously the project schedule.	0,00	3,70	11,11	29,63	48,15	7,41	400,00
To have a partner who has a sense of ownership of the project, participating effectively on it.	0,00	3,70	7,41	29,63	51,85	7,41	407,41
To have a partner who demonstrates to be proactive, taking initiative by itself, regarding project activities.	0,00	0,00	7,41	33,33	51,85	7,41	414,81
To strive to maintain partner's project data confidentiality.	3,70	0,00	0,00	11,11	77,78	7,41	437,04
To be in a transparent relationship with the company's partner.	0,00	0,00	0,00	18,52	74,07	7,41	444,44

To respect for the company's code of ethics regarding the relationship with the partner.	0,00	0,00	0,00	14,81	77,78	7,41	448,15
--	------	------	------	-------	-------	------	--------

Source: own.

Secondly, for respondents with Software Engineer category, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 5. Importance of a series of factors related with the team/company for the Software Engineer category.

Item	1 Strongly disagree	2 Partly disagree	3 Neither agree or disagree	4 Partly agree	5 Strongly agree	I don't know / Not applicable	Total Calculation
To help others with work issues	13,64	4,55	0,00	13,64	68,18	0,00	418,18
To take initiative to do beneficial actions in favor of the company and coworkers	4,55	13,64	13,64	31,82	36,36	0,00	381,82
To take care for their psychological well-being	9,09	4,55	13,64	36,36	36,36	0,00	386,36
To try to participate in informal social activities promoted by the company and/or coworkers	9,09	4,55	13,64	22,73	50,00	0,00	400,00
To take initiative to register and storage information/knowledge they gather	4,55	9,09	13,64	27,27	45,45	0,00	400,00
To make informal comments on lines of code	9,09	22,73	18,18	18,18	27,27	4,55	318,18
To make formal documentation (e.g. UML diagrams) about the code they are working with	4,55	9,09	9,09	45,45	31,82	0,00	390,91
To register lessons learned from software projects and problem solving	4,55	4,55	18,18	45,45	27,27	0,00	386,36
To search for knowledge about new tools, technologies and trends in software development.	9,09	9,09	9,09	36,36	36,36	0,00	381,82
To incorporate new knowledge they gather externally in projects/work routines.	9,09	9,09	9,09	40,91	31,82	0,00	377,27
To identify potential applications for our products/IP outside the corporate boundaries	9,09	0,00	13,64	40,91	31,82	4,55	372,73
To generate ideas based on distinct consumer insights, with a market-related approach.	13,64	0,00	4,55	40,91	22,73	18,18	304,55
To be able to describe professional or technical terms with conversational language to easy communication	4,55	9,09	13,64	45,45	22,73	4,55	359,09
To be encouraged to articulate and communicate what we have in mind	4,55	4,55	18,18	13,64	59,09	0,00	418,18

To be helped to articulate their ideas when they cannot express themselves clearly.	9,09	4,55	13,64	31,82	36,36	4,55	368,18
To use gathering opportunities to exchange knowledge informally, in a casual way	13,64	4,55	22,73	27,27	27,27	4,55	336,36
To convert the new knowledge they learn into effective actions for their work routines.	4,55	0,00	13,64	40,91	36,36	4,55	390,91
To use the new knowledge they acquire to understand context and motives behind real work situations	4,55	9,09	4,55	27,27	50,00	4,55	395,45
To use the new knowledge they learn to think about what improvements should be made in the work routine	9,09	9,09	4,55	31,82	40,91	4,55	372,73
To assess how the new knowledge they learn can be valuable to the work routine and for the interests of my company	4,55	4,55	4,55	31,82	50,00	4,55	404,55
There are well-defined norms and procedures to deal with knowledge, regarding its gathering, registering, sharing and use.	22,73	4,55	9,09	31,82	27,27	4,55	322,73
There is a well-defined infrastructure dedicated to storage and share the knowledge needed to perform work tasks, solve problems and to develop products.	4,55	9,09	13,64	13,64	50,00	9,09	368,18
Employees are properly rewarded for the knowledge contributions that they make	9,09	13,64	9,09	27,27	31,82	9,09	331,82
My company provides adequate physical spaces where employees can socialize and exchange knowledge	9,09	0,00	31,82	9,09	50,00	0,00	390,91
To have the technical abilities required.	0,00	0,00	9,09	13,64	63,64	13,64	400,00
To have relevant prior experience with similar projects.	0,00	0,00	13,64	31,82	45,45	9,09	395,45
To have high quality standards for work/project deliveries.	0,00	4,55	4,55	18,18	68,18	4,55	436,36
To have a strong sense of commitment towards partners.	4,55	9,09	18,18	18,18	40,91	9,09	354,55
To keep in touch continuously, providing feedback about projects' evolution.	4,55	4,55	13,64	18,18	54,55	4,55	400,00
To have a sense of ownership of the project, participating effectively.	4,55	0,00	13,64	27,27	50,00	4,55	404,55
To have a partner who strive for respecting rigorously the project schedule.	4,55	9,09	18,18	18,18	40,91	9,09	354,55

To have a partner who has a sense of ownership of the project, participating effectively on it.	4,55	0,00	13,64	27,27	45,45	9,09	381,82
To have a partner who demonstrates to be proactive, taking initiative by itself, regarding project activities.	4,55	0,00	9,09	22,73	50,00	13,64	372,73
To strive to maintain partner's project data confidentiality.	0,00	0,00	9,09	9,09	68,18	13,64	404,55
To be in a transparent relationship with the company's partner.	0,00	0,00	13,64	27,27	54,55	4,55	422,73
To respect for the company's code of ethics regarding the relationship with the partner.	0,00	0,00	18,18	13,64	59,09	9,09	404,55

Source: own.

Lastly, for the Developer category respondents, the percentage of votes for each of the options and their corresponding calculated score was as shown below:

Table 6. Importance of a series of factors related with the team/company for the Developer category.

Item	1 Strongly disagree	2 Partly disagree	3 Neither agree or disagree	4 Partly agree	5 Strongly agree	I don't know / Not applicable	Total Calculation
To help others with work issues	4,35	4,35	0,00	18,84	69,57	2,90	436,23
To take initiative to do beneficial actions in favor of the company and coworkers	2,90	4,35	8,70	33,33	49,28	1,45	417,39
To take care for their psychological well-being	1,45	10,14	8,70	30,43	49,28	0,00	415,94
To try to participate in informal social activities promoted by the company and/or coworkers	4,35	17,39	5,80	27,54	43,48	1,45	384,06
To take initiative to register and storage information/knowledge they gather	5,80	7,25	13,04	34,78	36,23	2,90	379,71
To make informal comments on lines of code	10,14	15,94	20,29	23,19	26,09	4,35	326,09
To make formal documentation (e.g. UML diagrams) about the code they are working with	11,59	15,94	23,19	17,39	28,99	2,90	327,54
To register lessons learned from software projects and problem solving	8,70	11,59	18,84	30,43	27,54	2,90	347,83
To search for knowledge about new tools, technologies and trends in software development.	4,35	5,80	4,35	24,64	59,42	1,45	424,64
To incorporate new knowledge they gather externally in projects/work routines.	2,90	2,90	13,04	33,33	46,38	1,45	413,04
To identify potential applications for our products/IP outside the corporate boundaries	8,70	10,14	11,59	26,09	26,09	17,39	298,55

To generate ideas based on distinct consumer insights, with a market-related approach.	7,25	4,35	13,04	27,54	33,33	14,49	331,88
To be able to describe professional or technical terms with conversational language to easy communication	2,90	7,25	7,25	44,93	36,23	1,45	400,00
To be encouraged to articulate and communicate what we have in mind	4,35	7,25	4,35	21,74	60,87	1,45	423,19
To be helped to articulate their ideas when they cannot express themselves clearly.	1,45	8,70	13,04	37,68	37,68	1,45	397,10
To use gathering opportunities to exchange knowledge informally, in a casual way	5,80	7,25	15,94	30,43	34,78	5,80	363,77
To convert the new knowledge they learn into effective actions for their work routines.	2,90	4,35	17,39	42,03	30,43	2,90	384,06
To use the new knowledge they acquire to understand context and motives behind real work situations	1,45	2,90	15,94	46,38	28,99	4,35	385,51
To use the new knowledge they learn to think about what improvements should be made in the work routine	2,90	4,35	8,70	47,83	34,78	1,45	402,90
To assess how the new knowledge they learn can be valuable to the work routine and for the interests of my company	1,45	4,35	14,49	40,58	36,23	2,90	397,10
There are well-defined norms and procedures to deal with knowledge, regarding its gathering, registering, sharing and use.	7,25	18,84	20,29	17,39	31,88	4,35	334,78
There is a well-defined infrastructure dedicated to storage and share the knowledge needed to perform work tasks, solve problems and to develop products.	1,45	11,59	14,49	24,64	44,93	2,90	391,30
Employees are properly rewarded for the knowledge contributions that they make	10,14	13,04	24,64	20,29	24,64	7,25	314,49
My company provides adequate physical spaces where employees can socialize and exchange knowledge	1,45	5,80	20,29	18,84	43,48	10,14	366,67
To have the technical abilities required.	4,35	2,90	5,80	21,74	47,83	17,39	353,62
To have relevant prior experience with similar projects.	2,90	8,70	7,25	24,64	39,13	17,39	336,23
To have high quality standards for work/project deliveries.	1,45	7,25	5,80	18,84	49,28	17,39	355,07
To have a strong sense of commitment towards partners.	2,90	2,90	10,14	14,49	49,28	20,29	343,48

To keep in touch continuously, providing feedback about projects' evolution.	1,45	1,45	5,80	21,74	50,72	18,84	362,32
To have a sense of ownership of the project, participating effectively.	1,45	2,90	7,25	15,94	52,17	20,29	353,62
To have a partner who strive for respecting rigorously the project schedule.	0,00	5,80	11,59	21,74	37,68	23,19	321,74
To have a partner who has a sense of ownership of the project, participating effectively on it.	0,00	4,35	10,14	23,19	39,13	23,19	327,54
To have a partner who demonstrates to be proactive, taking initiative by itself, regarding project activities.	1,45	4,35	5,80	23,19	42,03	23,19	330,43
To strive to maintain partner's project data confidentiality.	0,00	5,80	4,35	13,04	60,87	15,94	381,16
To be in a transparent relationship with the company's partner.	2,90	1,45	5,80	18,84	55,07	15,94	373,91
To respect for the company's code of ethics regarding the relationship with the partner.	0,00	4,35	0,00	10,14	68,12	17,39	389,86

Source: own.

4 Discussion

Of the 17 factors evaluated in relation to the development of innovation, the three profiles surveyed coincide in highlighting the following as important factors:

- Informal networking.
- Selling market-ready products.
- Participation in standardization (public standards).
- Customer & consumer co-creation.

Of the 17 factors evaluated, in three of them, the three profiles surveyed coincided in their majority response, assigning an Average Importance to the factor "Informal networking" and a High Importance to the factors "Joint-venture activities" and "Participation in standardization (public standards)".

Differentiating by profile, the factors highlighted as most important by respondents in the manager category were:

First, in order to identify the factors chosen as most relevant by the manager category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 280 points. The following seven factors are the most relevant: "Contracted R&D services", "Informal networking", "Joint-venture activities", "Selling market-ready products",

"Participation in standardization (public standards)", "Customer & consumer co-creation" and "Idea & start-up competitions".

Secondly, in order to identify the factors chosen as most relevant by the respondents with software engineer category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 280 points. The most relevant factors are the following seven: "Contracted R&D services", "Informal networking", "Supplier innovation awards", "Selling market-ready products", "Participation in standardization (public standards)", "Donations to commons or non-profits" and "Customer & consumer co-creation".

Lastly, in order to identify the factors chosen as most relevant by the respondents with the development category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 260 points. The most relevant factors are the following six: "Informal networking", "Joint-venture activities", "Selling market-ready products", "Participation in standardization (public standards)", "Customer & consumer co-creation" and "Idea & start-up competitions".

Respondents with a developer profile are the ones who have marked the most factors as "I don't know/Not applicable", in fact, for "IP out-licensing", "Specialized open innovation intermediaries", "Supplier innovation awards", "University research grants", "Creation of spin-offs", "Corporate business incubation" and "Publicly funded R&D consortia", this has been the most indicated option.

Of the Manager and Software Engineer profiles, "High Importance" was the most frequently mentioned option in 10 and 9 factors, respectively.

Of the 36 factors evaluated in relation to the relevant factors within the teams and the company, the three profiles surveyed coincide in highlighting the following as important factors:

- To help others with work issues.
- To be encouraged to articulate and communicate what we have in mind.

Differentiating by profile, the factors highlighted as most important by respondents in the manager category were:

First, in order to identify the factors chosen as most relevant by the respondents with manager category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 440 points. The following seven items are the most relevant: "To help others with work issues", "To take initiative to do beneficial actions in favor of the company and coworkers", "To be able to describe professional or technical terms with conversational language to easy communication", "To be encouraged to articulate and communicate what we have in mind", "To be helped to articulate their ideas when they cannot express themselves clearly", "To be in a transparent relationship with the company's partner" and "To respect for the company's code of ethics regarding the relationship with the partner".

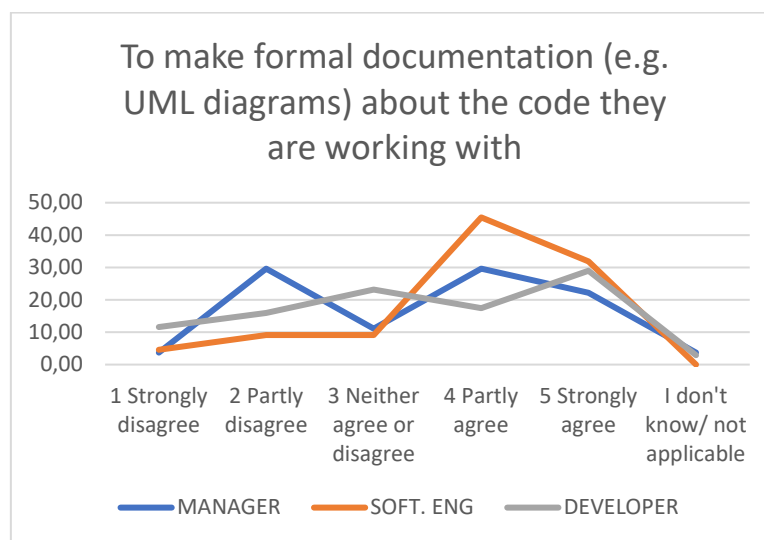
Within this category, respondents overwhelmingly chose "Strongly Agree" for 28 of the statements.

Secondly, in order to identify the factors chosen as most relevant by the respondents with software engineer category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 400 points. Being the most relevant points the following eight: "

To help others with work issues", " To be encouraged to articulate and communicate what we have in mind", " To assess how the new knowledge they learn can be valuable to the work routine and for the interests of my company", " To have high quality standards for work/project deliveries.", " To have a sense of ownership of the project, participating effectively.", " To strive to maintain partner's project data confidentiality.", "To be in a transparent relationship with the company's partner. "and "To respect for the company's code of ethics regarding the relationship with the partner. "

Of the respondents with Manager profile, 22 statements were marked with "Strongly Agree" as the most selected option, it is worth noting that within the respondents with this category, the only statement in which "Partly Disagree" is reflected as the most selected option, is the statement "To make formal documentation (e.g. UML diagrams) about the code they are working with".

Figure 4. Graph of the results of a factor according to the three categories.

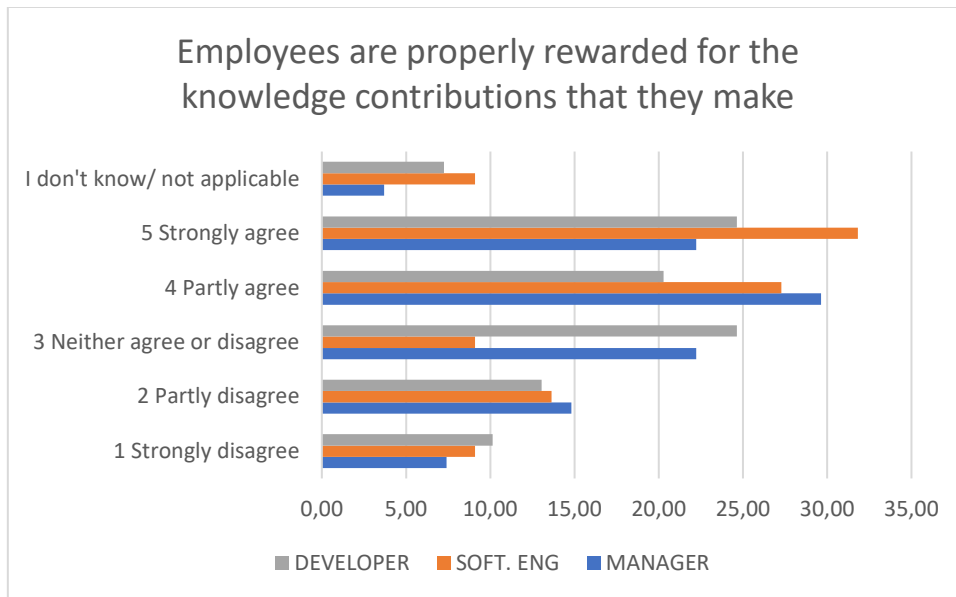


Source: own.

Lastly, in order to identify the factors chosen as most relevant by the respondents with developer category, it was decided to select as a cut-off criterion those factors with a total calculation of more than 400 points. The most relevant points being the following seven: "To help others with work issues", "To take initiative to do beneficial actions in favor of the company and coworkers", "To take care for their psychological well-being", "To search for knowledge about new tools, technologies and trends in software development", "To incorporate new knowledge they gather externally in projects/ work routines.", "To be encouraged to articulate and communicate what we have in mind" and "To use the new knowledge they learn to think about what improvements should be made in the work routine".

Respondents with a Developer profile were the ones who agreed with the most statements, choosing "Strongly agree" in 31 of them. The only statement in which the majority option chosen was "Neither agree or disagree" was the following: "Employees are properly rewarded for the knowledge contributions that they make".

Figure 5. Graph of the results of a factor according to the three categories.



Source: own.

5 Conclusions

As a conclusion to the study carried out, the importance of the learning obtained in each of the phases of the project should be highlighted. In the first place, the knowledge acquired in relation to data collection and the strategy to be followed to obtain the data as quickly and accurately as possible. On this point, the collaboration with the researcher Leonardo, who has helped me to develop the best possible recruitment strategy and has even participated directly in the recruitment of respondents, has been of great help.

With regard to the extraction of information, I would like to underline the importance of the approach taken, where it was decided to set the object of the study according to three different professional profiles. This has allowed us, by calculating the percentage and its subsequent calculation of the score, to establish a criterion that allows us to identify the most important factors for the different profiles studied.

Analyzing the information obtained, we can conclude that we are dealing with three different profiles, which have different knowledge and daily tasks, therefore also with a different perception of innovation and a different relationship with the team and the company, which has a clear impact on the different results obtained in the surveys. However, it has also been of great value to highlight the common points that these three profiles have shown.

For all these reasons, it is worth highlighting the great usefulness of the study carried out as a final touch to the university master's degree in industrial engineering and the opportunity to learn about relevant aspects of software companies in Canada, with all that this implies.

6 Bibliography

1. [What is innovation? Definition, management models, tips - Toolshero | https://www.toolshero.com/innovation/](https://www.toolshero.com/innovation/)
2. [Índice Mundial de Innovación 2022: Suiza, los Estados Unidos y Suecia lideran la clasificación del Índice Mundial de Innovación; China se acerca al puesto 10; ascenso rápido de la India y Türkiye; la innovación centrada en la incidencia, necesaria en tiempos convulsos \(wipo.int\) | https://www.wipo.int/pressroom/es/articles/2022/article_0011.html](https://www.wipo.int/pressroom/es/articles/2022/article_0011.html)
3. [Software para empresas: ingresos en Canadá 2016-2021 | Statista | https://es.statista.com/estadisticas/966399/ingresos-del-mercado-de-software-para-empresas-en-canada/#:~:text=Esta%20estad%C3%ADstica%20muestra%20los%20ingresos%20del%20mercado%20de,los%20ingresos%20para%202021%20es%20de%202.689%2C1%20millones.](https://es.statista.com/estadisticas/966399/ingresos-del-mercado-de-software-para-empresas-en-canada/#:~:text=Esta%20estad%C3%ADstica%20muestra%20los%20ingresos%20del%20mercado%20de,los%20ingresos%20para%202021%20es%20de%202.689%2C1%20millones.)