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Programmer Performance Influencing Factors with Sequential Explanatory Model

Case Study in Data Warehouse and IT Center of UIN Sunan Kalijaga Yogyakarta

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Abstract—**Implementation is one of phases in Software Development Life Cycle (SDLC). A programmer is a software development leader decides whether software is completed on time or postpone according to development schedule. Data Warehouse and IT Center (PTIPD) is a software developer official vendor in UIN Sunan Kalijaga, they developed a growing number of software to facilitate administrative processes in college academic community. This is an analysis to determine the factors that most influence the developers. The object of this research are nine people. They are all software programmer in PTIPD. The research using Mixed Methods Research that combines two methods of research, qualitative and quantitative. Two factors from previous research are factors materialistic and non-materialistic factors. Materialistic factors are Reward and Punishment; Career Development and Contra-Accomplishment, Incentive and Bonus. Non-Materialistic factors are Usefulness, Relationships and Spirituality. Preliminary data taken from interviews, observation and documentation study to discover object opinions and views. Validity Test and Reliability Test using SPSS software for qualitative data is provided. The most influencing factor for performance of SDLC programmers of PTIPD UIN Sunan Kalijaga is Usefulness with the highest values are on three informants: Oscar, Bravo, and Mike, also Relations with the highest values are on three informant: Delta, Sierra, and Zulu.**

Keywords-Career development; programmer performance; relationship; sequential explanatory; mixed method research

I. INTRODUCTION

What do people build to be able managing documentation, simplify work and store it digitally? The answer is no other than software. According to Pressman, software has now become a decisive force. It is become control decision engine in the business world; serves as basis for form of services and modern scientific research. Software is attached to all system forms; transportation, medical, telecommunications, military, industrial processes, entertainment, office products, and others [1].

Software development is also become a necessity in organizations, including UIN Sunan Kalijaga. Based on the Decree of the Minister of Religion Republic of Indonesia number 385 of 1993 at December 29, 1993, about Organization and Work Procedure in IAIN Sunan Kalijaga Yogyakarta. Article 60 explains about Pusat Komputer *(Computer Center*), which explains that Pusat Komputer is a supporting element of IAIN Sunan Kalijaga in the field of computers (article 60 paragraph 1), therefore software as academic support activities built in UIN Sunan Kalijaga [2].

In [3], it is explained that Pengembangan Sistem Informasi (*Information System Development)* division was part of the Pusat Komputer dan Sistem Informasi *(Computer Center and Information System*) PKSI (later called PTIPD) was an active element in software developing for Sunan Kalijaga UIN. She did an observations for two weeks and found several facts that influenced software development at PTIPD [3].

1. PTIPD is a unit in UIN Sunan Kalijaga as university, not as independent software developer organization. PTIPD build software and information system for universities considering as non-profit product, as PTIPD form of service. They do not implement a finance management. The success of the project is generally seen by software availability and on-time software deliverance software resolving the problem.
2. Development division has not yet have a fixed programming standard.
3. The development division has not applied certain standards to manage project quality management.

Now, software built by PTIPD UIN Sunan Kalijaga become one of facilitation for various administrative and lecture activities. Development involves actor (programmer), time, target, objectives and implementation.

In the implementation of SDLC, affected actors from software developers are the programmer. The Internal and Non-Technical domain is also divided into two, Intangible and Tangible. Both of these can affect the development actors behavior (software programmers) as told by Irvine [4].

There are nine people currently in the implementation process for software in PTIPD UIN Sunan Kalijaga. What are the internal non-technical factors that influence programmer performance in the software development process at PTIPD? This research focuses only in software implementation phase (coding). We will discuss scale and study about the sequence of factor in each research subject.

II. RESEARCH ETHODOLOGY

A. Mixed Methodology Research

The researcher used Mixed Method with the Sequential Exploratory model. As explained in [5] it is said that:

> *"As with the Explanatory Design, the intent of the two-phase Exploratory Design is that the results of the first method (qualitative) can help develop or inform the second method (quantitative)* "

Sequential Exploratory model (see Fig. 1) is taken from qualitative data, explores phenomena and continues with the second phase, the quantitative phase. The researcher applied this design began from qualitative finding in the first phase then develop the instrument, identify variables and test in the second phase.

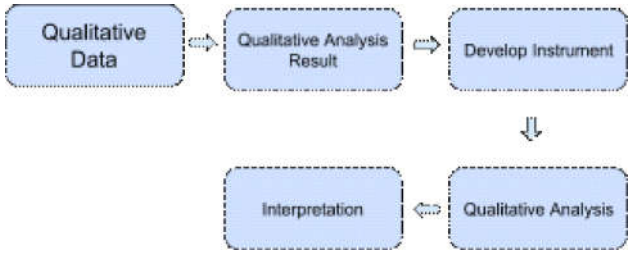

Figure1. Model sequential explanatory method

The Exploratory Sequential Design method is divided into two phases. At first step, researcher make instruments and collect data. The data collected is qualitative data, either coding or themes. These themes and parameters are then analyzed with the results obtained in the field with interview and observation; researchers get results in the form of Qualitative Finding to a qualitative instrument in the form of numbers (ordinal or nominal) and tested by statistical techniques. The combination of the two methods of data is connecting (connecting) from the results of the first phase of research (the results of qualitative research) with the results of the next stage (the results of quantitative research). In many mixed research methods, participants in the first phase of the study are also participants in the next phase.

B. Parameter Test

Materialistic Factor Parameter

Previous studies have examined relationship of reward and punishment to colleague in research with title "Relationships between Leader Reward and Punishment Behavior and Subordinate Attitudes, Perceptions, and Behaviors: A Meta-Analytic Review of Podsakoff, etc., explained that there is a relationship between subordinate behavior and punishment and reward made by the leader [6].

Refer to the literature on materialistic factors and non-realistic factors; it is grouped into three major groups of factors. They are:

1. Reward and Punishment (Leader reward and Punishment Behavior [6], Punishment Preventive and Punishment Repressive [7].
2. Career Development [7]
3. Achievement and Bonus [7].

Non-Materialistic Factor Parameter

Spirit comes from Latin, *spiritus*, which means breath. According to the Oxford Dictionary that "spirit" is "non-physical part of a person which is the seat of emotions and character; the soul "which means" the non-physical part of a human being which is the center of emotion and character; soul.

A study conducted by Kinjerski & Skrypnek [8], it is measuring the assessment of spiritual experience in the workplace. From the study, it stated that 333 employees from major universities in the Midwest, ranging from traders to senior administrative employees, responding to 102 item instruments that examined aspects of spirit at work. Analysis factors to be a parameter are four different factors: interest work, sense of togetherness, spiritual connection, and mystical experience [8].

In non-realistic factors, there are also three parameters:

1. Usefulness [9],
2. Relation [8] Relations Co-workers were taken from May et al, the Supervisor Relations were taken from May etc.) and
3. Spirituality [8].

C. Qualitative Analysis Result

Data Coding

In the research subject, there are nine people works as Software Developer in PTIPD. All of them given pseudonym as Oscar, Delta, Bravo, Sierra, Victor, Mike, Zulu and Quebec.

Materialistic Factor code is FM, Reward and Punishment is FM1, Career Development is FM2 and Achievement and Bonus is FM3. In Non Materialistic Factor, the code is FNM, Usefulness is FNM1, Relationship is FNM2 and Spirituality is FNM3.

In observation, code from observation result in paper or in sheet are coded by Ob-[research object/name of actor/ e.g. Oscar]-XX (data of observation - YY (serial number in the attachment).

In interview, code from observation result in paper or in sheet are coded by Wa-[research object/name of actor/ e.g. Oscar]-XX (data of observation - YY (serial number in the attachment).

Data Collection: Observation

Data collection carried out simultaneously with the ongoing research, the possibility of interview data, observation and documentation studies reported immediately is possible. Data collection took place from the first week of January to the first week of February 2015. The result are 12 observation sheets containing research records during observation.

Data Collection: Interview

Interview taken place in several spot including a lake in Yogyakarta when the researcher come together in a nice small vacation in at January 24, 2015. Sometimes, it is in the middle of working office also. Like in transcript Oscar-Wa-22-XX it is concluded that Oscar didn't have time to do a freelancer outside PTIPD because Oscar really busy with Academic Information System that Oscar involved in.

Data Reduction

By doing data reduction, it will give a clear picture and make it easier for researchers to do further data collection and doing another search for more data. At this stage the data that has been coded with Factor Materialistic (FM) and Factor Non-Materialistic with code (FNM), grouped and will be summarized to give a clearer view.

Data Analysis

Data analysis is for understanding and answer data characteristic from problems related to research activities, by trying to process data into information, as in "A positive approach to qualitative policy and evaluation research." [10]. Data retrieve from two kinds; secondary data and primary data. In Moleong, primary data are interview or direct observation [11]. Primary data is directly obtained from informants that is all programmers in PTIPD UIN Sunan Kalijaga. Secondary data are obtained from documentation studies for example from the informant's twitter account and Facebook status. Secondary data is easy and fast because it is always available.

D. Quantitative Analysis

Sample Population

Population are nine programmers at PTIPD UIN Sunan Kalijaga.

Data Label

It is already given in Coding.

Scoring

We use Likert scale to interpret qualitative research results from non-technical and factors internal influencing programmer performance in the software development process. The result are number. Likert scale is a scale used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena. The scale is 5 for *strongly agree*, 4 for *agree*, 3 for *neutral*, 2 for *disagree* and 1 for *strongly disagree*.

Validity and Reliability Test

Formula (1) is used to count *r*.

$$r_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{\{n\sum x^2 - (\sum x)^2\}\{n\sum y^2 - (\sum y)^2\}}} \quad (1)$$

III. DISCUSSION

To find the initial interpretation, researchers used qualitative research methods, purposive sampling method, interviews and observations to nine research objects at PTIPD Sunan Kalijaga UIN.

A. Actors and Research Object Result

Oscar

The result from Oscars are Usefulness (FNM1) with values 4.4; Relation (FNM2) with interpretation values 3.3; Reward and Punishment (FM1) with interpretation values 2.4; Career Development (FM2) with interpretation values 2.2; Achievement, and Bonus (FM3) with interpretation values 2; Spirituality (FNM3) with an interpretation value of 1,667.

Delta

The result from Delta are Relation (FNM2) with interpretation value 4.15. Usefulness (FNM1) with interpretation value 2.727. Career Development (FM2) with interpretation value 2.4. Spiritual (FNM3) with interpretation value 2.333. Reward and Punishment with interpretation value 2.2. Achievement and Bonus (FM3) with interpretation value 2.

Bravo

The result from Bravo are Career Development (FM2) with interpretation value 4.2. Usefulness (FNM1) with interpretation value 3.09. Relation (FNM2) with interpretation value 3. Reward and Punishment (FM1) with interpretation value 2.4. Spiritual (FNM3) with interpretation value 1.667. Achievement and Bonus (FM3) with interpretation value 1.

Sierra

The result from Sierra are, Relation (FNM2) with interpretation value 3.2. Reward and Punishment (FM1) with interpretation value 3; Spiritual (FNM3) with interpretation value 0; Usefulness FNM1 with interpretation value 0; Career Development (FM2) with interpretation value 0; Achievement and Bonus (FM3) with interpretation value 0.

Victor

The result from Victor are, Spiritual (FNM3) with interpretation value 4.67; Usefulness with interpretation value 3.73; Relation (FNM2) with interpretation value 3.3; Reward and Punishment (FM1) with interpretation value 3; Career Development (FM2) with interpretation value 2.6; Achievement and Bonus (FM3) with interpretation value 0.

Mike

The result from Mike are, Career Development (FM2) with interpretation value 3.8; Reward and Punishment (FM1) with interpretation value 3; Usefulness FNM1 with interpretation value 2.55; Relation (FNM2) with interpretation value 1.45; Spiritual (FNM3) with interpretation value 1; Achievement and Bonus (FM3) with interpretation value 1.

Golf

Numbers 0 dominates all results of Golf's research.

Zulu

The result from Zulu are Career Development (FM2) with interpretation value 3.4; Relation (FNM2) with interpretation value 3.3; Usefulness FNM1 with interpretation value 2.91; Spiritual (FNM3) with interpretation value 2.67; Reward and Punishment (FM1) with interpretation value 2.2; Achievement and Bonus (FM3) with interpretation value 1.5.

Quebec

The result from Quebec are Reward and Punishment (FM1) with interpretation value 4.2; Relation (FNM2) with interpretation value 2.45; Spiritual (FNM3) with interpretation value 2; Career Development (FM2) with interpretation value 2; Usefulness (FNM1) with interpretation

value 1.9; Achievement and Bonus (FM3) with interpretation value 1.

TABLE I. FIRST PHASE CONCLUDE

No	Object	Materialistic Factor			Non-Materialistic Factor		
		FM1	FM2	FM3	FNM1	FNM2	FNM3
1.	Oscar	2.4	2.2	2	**4.091**	3.3	1.667
2.	Delta	2.2	2.4	2	2.73	**4.15**	2.33
3.	Bravo	2.4	4.2	1	**3.091**	3	1.33
4.	Sierra	3	-	-	-	**3.2**	-
5.	Victor	3	2.6	-	3.73	3.3	**4.67**
6.	Mike	1.8	**3.8**	1	2.55	1.45	1
7.	Golf	-	-	-	-	-	-
8.	Zulu	2.2	**3.4**	1.5	2.91	3.3	2.67
9.	Quebec	**4.2**	2	1	1.9091	2.45	2
AVERAGE		**2.35**	**2.28**	**0.94**	**2.33**	**2.68**	**1.74**

From Table 1 it can be seen that Achievement and Bonus (FM3) is considered the lowest value because the inadequate data found in the field. Career Development (FM2) is also considered not to have sufficient data. The factor that has the largest average value is FNM2: Relationship. Both FM3 and FM2 factors are omitted from the list of factors to be tested in the Reliability and Validity Test.

B. Reliability and Validity Test

Materialistic Factor: Reward and Punishment

In addition to find influencing factor in each research subject, this study also tested the validity and reliability of each data processing.

TABLE II. CORRELATION TEST RESULT IN FM1

Correlations

		YQFM1	QFM1.1	QFM1.2	QFM1.3	QFM1.4	QFM1.5
YQFM1	Pearson Correlation	1	.835**	.864**	.915**	.918**	.731*
	Sig. (2-tailed)		.005	.003	.001	.000	.025
	N	9	9	9	9	9	9
QFM1.1	Pearson Correlation	.835**	1	.524	.596	.958**	.412
	Sig. (2-tailed)	.005		.148	.090	.000	.270
	N	9	9	9	9	9	9
QFM1.2	Pearson Correlation	.864**	.524	1	.888**	.629	.607
	Sig. (2-tailed)	.003	.148		.001	.070	.083
	N	9	9	9	9	9	9
QFM1.3	Pearson Correlation	.915**	.596	.888**	1	.717*	.705*
	Sig. (2-tailed)	.001	.090	.001		.030	.034
	N	9	9	9	9	9	9
QFM1.4	Pearson Correlation	.918**	.958**	.629	.717*	1	.593
	Sig. (2-tailed)	.000	.000	.070	.030		.092
	N	9	9	9	9	9	9
QFM1.5	Pearson Correlation	.731*	.412	.607	.705*	.593	1
	Sig. (2-tailed)	.025	.270	.083	.034	.092	
	N	9	9	9	9	9	9

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE 1II. RELIABILITY TEST RESULT IN FM1

Case Processing Sumr

		N
Cases	Valid	
	Excluded[a]	

From Tabel II it can be seen that Reward and Punishment (FM1) with 0.005. This number is less than 0.05 (significance value parameter) which means that this is a significant correlation. From the results of the reliability test (Table III) it can be seen that the Alpha value which is 0.816 is bigger than 0.7. This means that it fulfills the value (sufficient reliability).

Non-Materialistic Factor: Usefulness (FNM1)

In addition to Materialistic factor (FM), the validity and reliability is also tested to FNM. FNM 1 is Usefulness (FNM1).

TABLE IV. CORRELATION TEST RESULT IN FNM1

Correlations

		YQFNM4	QFNM4.1	QFNM4.2	QFNM4.3	QFNM4.4	QFNM4.5	QFNM4.6	QFNM4.7	QFNM4.8	QFNM4.9	QFNM4.10	QFNM4.11
YQFNM4	Pearson Correlation	1	.940**	.968**	.930**	.933**	.865**	.957**	.945**	.892**	.954**	.976**	.955**
	Sig. (2-tailed)		.000	.000	.000	.000	.003	.000	.000	.001	.000	.000	.000
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.1	Pearson Correlation	.940**	1	.870**	.899**	.880**	.744*	.920**	.933**	.733*	.956**	.976**	.919**
	Sig. (2-tailed)	.000		.002	.001	.002	.022	.000	.000	.025	.003	.000	.000
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.2	Pearson Correlation	.968**	.870**	1	.870**	.871**	.869**	.875**	.877**	.921**	.929**	.925**	.965**
	Sig. (2-tailed)	.000	.002		.002	.002	.002	.002	.002	.000	.000	.000	.000
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.3	Pearson Correlation	.930**	.899**	.870**	1	.778*	.941**	.920**	.883**	.733*	.856**	.916**	.863**
	Sig. (2-tailed)	.000	.001	.002		.013	.000	.000	.002	.025	.003	.001	.003
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.4	Pearson Correlation	.933**	.880**	.871**	.778*	1	.673*	.914**	.919**	.884**	.905**	.904**	.851**
	Sig. (2-tailed)	.000	.002	.002	.013		.047	.001	.000	.002	.001	.001	.004
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.5	Pearson Correlation	.865**	.744*	.869**	.941**	.673*	1	.812**	.735*	.755*	.940**	.793*	.813**
	Sig. (2-tailed)	.003	.022	.002	.000	.047		.008	.024	.019	.005	.011	.008
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.6	Pearson Correlation	.957**	.920**	.875**	.920**	.914**	.812**	1	.955**	.764*	.926**	.957**	.845**
	Sig. (2-tailed)	.000	.000	.002	.000	.001	.008		.000	.017	.001	.000	.004
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.7	Pearson Correlation	.945**	.933**	.877**	.883**	.919**	.735*	.955**	1	.772*	.839**	.974**	.866**
	Sig. (2-tailed)	.000	.000	.002	.002	.000	.024	.000		.015	.005	.000	.003
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.8	Pearson Correlation	.892**	.733*	.921**	.733*	.884**	.755*	.764*	.772*	1	.885**	.800**	.889**
	Sig. (2-tailed)	.001	.025	.000	.025	.002	.019	.017	.015		.002	.010	.001
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.9	Pearson Correlation	.954**	.956**	.929**	.856**	.905**	.940**	.926**	.839**	.885**	1	.896**	.896**
	Sig. (2-tailed)	.000	.003	.000	.003	.001	.005	.000	.005	.002		.001	.001
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.10	Pearson Correlation	.976**	.976**	.925**	.916**	.904**	.793*	.957**	.974**	.800**	.896**	1	.941**
	Sig. (2-tailed)	.000	.000	.000	.001	.001	.011	.000	.000	.010	.001		.000
	N	9	9	9	9	9	9	9	9	9	9	9	9
QFNM4.11	Pearson Correlation	.955**	.919**	.965**	.863**	.851**	.813**	.845**	.866**	.889**	.896**	.941**	1
	Sig. (2-tailed)	.000	.000	.000	.003	.004	.008	.004	.003	.001	.001	.000	
	N	9	9	9	9	9	9	9	9	9	9	9	9

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Usefulness (FNM1) has a significance value 0.03 (see Table IV) which is bigger than 0.05. It means this is a significant correlation. From the results of the reliability test which can be seen in Table V, it can be seen Alpha value is 0.790 which is bigger than 0.7. This means that it is sufficient reliability.

TABLE V. RELIABILITY TEST RESULT IN FNM1

Case Processing Sum

		N
Cases	Valid	
	Excluded[a]	

Non-Materialistic Factor: Relation (FNM2)

TABLE VI. CORRELATION TEST RESULT IN FNM2

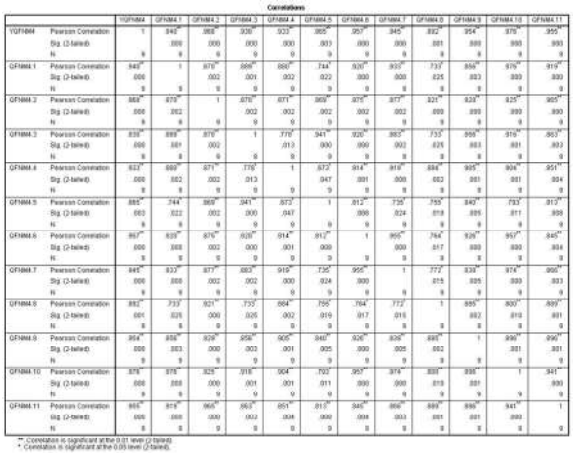

TABLE VII. RELIABILITY TEST RESULT IN FNM2

Case Processing Sum

		N
Cases	Valid	
	Excluded[a]	

FNM2 has a significance value 0.02 (see Table VI). It is bigger than 0.05, which means there is a significant correlation. From the results of the reliability test (Table VII) it can be seen that Alpha value is 0.770 which is bigger than 0.7. This means that it is sufficient reliability.

Non-Materialistic Factor: Spiritual FNM3

TABLE VIII. CORRELATION TEST RESULT IN FNM3

Correlations

		YQFNM6	QFNM6.1	QFNM6.2	QFNM6.3
YQFNM6	Pearson Correlation	1	.976**	.915**	.959**
	Sig. (2-tailed)		.000	.001	.000
	N	9	9	9	9
QFNM6.1	Pearson Correlation	.976**	1	.854**	.918**
	Sig. (2-tailed)	.000		.003	.000
	N	9	9	9	9
QFNM6.2	Pearson Correlation	.915**	.854**	1	.794*
	Sig. (2-tailed)	.001	.003		.011
	N	9	9	9	9
QFNM6.3	Pearson Correlation	.959**	.918**	.794*	1
	Sig. (2-tailed)	.000	.000	.011	
	N	9	9	9	9

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Spirituality (FNM3) has a significance value 0.001 (table VIII). It is bigger than 0.05 and it is considered significant correlation. It is said by Pearson Correlation, the value that is connected between each variable with asterisk has significant correlation between connected parameters.

TABLE IX. RELIABILITY TEST RESULT IN FNM3

Case Processing Sum

		N
Cases	Valid	
	Excluded[a]	
	Total	

From the results of the reliability test as given in Table IX, it can be seen that Alpha value is 0.876, which is bigger than 0.7. This means that it is sufficient reliability.

IV. CONCLUSION AND SUGGESTION

A. Conclusion

Based on the study, it can be concluded that the highest value in object of research, in this case the software developers at PTIPD UIN Sunan Kalijaga is the Relationship. It is one of measurement in Non-Materialistic Factor. It spreads throughout the population.

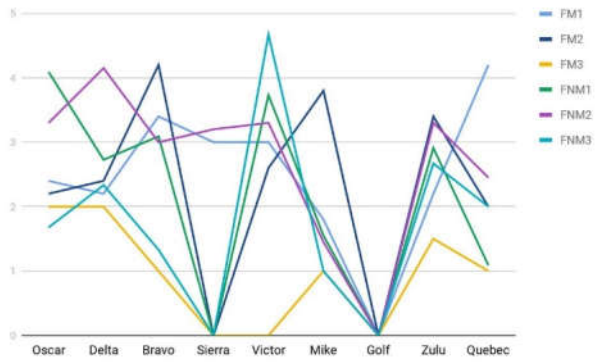

Figure 1 Distribution values from six factors

It is also found the most influencing factor for each research object. The most influencing factor for Oscar is Non-Materialistic Factor 1 Usefulness with 4,091. Delta has Relationship or FNM2 as the most influencing factor with 4.15. Bravo has the most influencing factor in Relationship with 3,091. Sierra with 3.2 on Non-Materialistic Factor 2 Relationship. Victor is most influenced by Non Materialistic Factor 3 Spirituality with 4.67, which becomes the highest value of all data. Mike with 2.55 in Non-Materialistic Factor 1 Usefulness made it is the most influencing factor for Mike to develop software. Golf does not get value because the data is 0. In Zulu, the factor that most influences him is Usefulness with a value of 2.91, while Quebec get high score 4.2 in Reward and Punishment.

From the explanation above, it can be seen that the highest score factor is the Non Materialistic Factor 1, that is Usefulness. It makes FNM1 is the most influencing factor for programmer performance in the software development process.

B. Suggestion

In this study, researchers realized the lack of deep observation. Suggestion for the next research:

1. Validity Test per informant can be a requirement in order to show validity data per object.
2. In-depth research to produce more complete information and data.
3. Need to do a similar survey to a wider object.
4. Further research not just research in the implementation phase (coding).

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