

Understanding Work Engagement in BIM: A Positive Psychology
Approach

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Abstract

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Building Information Modeling is a reinvigorating the AEC industry and changing the ways the business operations and organizational structures of the companies need to be transformed. One other issue that comes with this transformation is about preparation to face the challenges and opportunities that come along with BIM. Being competitive in this market means an effective strategy to recruit the best possible talent, cultivate and retain them. There are many new titles of BIM and upcoming specialty BIM/VDC departments which also demands closer scrutiny to the existing work methods and evaluation of the staff members. This research investigates how the employees perceive their job in the VDC/BIM departments and their energy and motivation to continue in this area. This is important to know for the managers and

HR representatives as it would give them an idea of the efficiency and productivity of the BIM talent they have acquired. Results include a descriptive analysis regarding employee engagement and suggestions which a BIM/VDC manager should implement to initiate critical thinking and formulate strategies for a better employee work experience. Lastly, the research takes the first step towards understanding the employee engagement in the construction industry from an academic standpoint.

Keywords: BIM, AEC Industry, VDC, Employee Engagement, Flow

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List of Abbreviations

HR - Human resource

BIM – Building Information Modeling

ESM – Employee Sampling Method

WOLF – WOrk reLated Flow inventory Survey

IMV – Intrinsic Work Motivation

WE – Work Enjoyment

Abs – Absorption

I – Introduction

Construction is one of the most important industry for the national economy for countries all around the world, it traditionally takes up a huge portion of the employment and also contributes to the nation's revenue as a whole. The major issues in the construction industry are poor safety, poor performance, low productivity and insufficient conditions which are also recorded and witnessed by practitioners all around the world. Responding to these challenges imposes an urgency to raise quality, productivity and newer technologies to the industry. A lack of responsiveness can hold back growth & development of the needed infrastructure and other sectors in the nation.

Building Information Modeling (BIM) is currently one of the most sought after and promising trends in the AEC industry. A digitally constructed to scale and accurate model of the project is called a building information model. It helps the integration of all the stakeholders involved in the project. It helps the stakeholders by enabling them to visualize the project in a simulated environment which eases the identification of any potential issue arising during construction, planning or operation. BIM paradigm helps address the common problems like productivity, safety and performance in the AEC industry. **(Azhar, Nadeem et al. 2008)**

According to the Bureau of Labour Statistics (BLS) of the U.S. Department of Labour, the demand for highly skilled construction professionals (architects, engineers and

constructors) is expected to outpace the supply over the next twenty years (**Smith and Tardif 2009**). This forecast bears special implications at a time when building information modelling (BIM) is gaining accelerated uptake in global construction industry. It is consistent with what many industry professionals and research scholars have observed that BIM-savvy people will be in high demand and the lack of adequately trained personnel is hindering the use and adoption of BIM in the industry (**Sacks and Barak 2010, Becerik et al 2011**). BIM although is bringing newer opportunities but it also increases the competition within the industry.

There are many structural and organizational changes required to facilitate all the new job title prefixed with BIM Eg: BIM Modeler, BIM Manager, BIM Co-coordinator etc. into the newer functional units like BIM/VDC department. This makes impetus to rethink the profiling and planning of workforce oriented to BIM tasks. This has to be taken into consideration as BIM is a revolutionary shift away from the then technology of CAD. (**Wu and Issa, 2013**)

In the case when "dedicated BIM talent" (usually associated with BIM-prefixed job titles) is the target, the acquired BIM talent should not be an "add-on" to existing organizational structure, or a "plug-in" for existing business process in the companies. Rather, they should be organically integrated into the corporate structure, interdependent on current human resources (HR), (**Wu and Issa, 2013**) to integrate them and eventually work towards understanding them better and optimally utilize them. They need to be able to identify and realize the gaps and make training plans as per the employees. HR today has a very important role in the organization. They need to play their part to increase the productivity of each department and thus make it capable enough to face the industry challenge. By understanding the employee's perception of work the HR and managers can

optimally utilize their talent and reap the benefits of the advantages provided by BIM and hence obtain productivity growth as expected.

Need to Study and Research Question

A simple search on google scholar gives out 55,900 results for the term “Employee Engagement” and 42,000 results for the term “Work Engagement”. But when these terms were used with the phrase construction industry especially BIM/VDC no significantly useful results were found. Engagement is a important term when it comes to roles such as BIM where the majority of the respondents have to stay in one place and work with high concentration and interaction as per need also the results are not seen right away except for activities like clash detection and coordination. There have not been many studies which try to understand the amount of involvement, enjoyment and motivation of the employees working in the new and upcoming BIM/VDC departments. These data will help the HR and Managers optimally utilize their talent and make changes so that employees do not face burn-out.

The engagement of the employees will be accessed by measuring a term called “Flow”, a state of complete immersion in an activity which is popularized by Mihály Csíkszentmihályi who is a psychologist. Flow is the merging of action and awareness; a state that one experiences when skill and challenge meet (Csikszentmihalyi, 1975) . Flow can occur at any time in almost any setting, depending on the individual, provided certain conditions are met, such as a balance of challenges and skills (Csikszentmihalyi, 1990, 1993).A popular questionnaire used in positive psychology

to understand the employee engagement called the WOLD questionnaire will be used but certain changes in the statements are done to better fit the construction industry.

The main objective is to:

- To help us understand and assess the level of employee engagement in the domain of BIM by measuring the occurrence of flow while performing the activities of BIM.
- To help us understand the factors which contribute to a better engagement among individuals
- Understanding the type and nature of individuals who enjoy working in the BIM department.

This research will fill in the gap of the lack of research in the AEC industry and will add to the existing knowledge of how employee engagement is in BIM/VDC department and how it can be further improved. This study will act as a baseline case to understand the strength and weakness of the current environment when the BIM employees are working and will enable us to identify possible solutions, if needed, for improvement.

II – Literature Review

Flow is the common element in recreation and work activities and is a desired experience that leaves the individual feeling satisfied and motivated. This chapter includes literature study which explains flow, how to measure flow and BIM/VDC personnel.

Flow

Originally referred to as an autotelic experience, the term "flow" was introduced as a result of interviewees' responses of optimal experiences **(Csikszentmihalyi, 1975)**.

Dr. Csikszentmihalyi (1975) studied creativity in artists for his doctoral thesis, and during this time, he noticed the behaviors of the sample that intrigued him. These behaviors were later determined to be flow, a behavior he described as "strange and unaccountable" at the time.

Csikszentmihalyi (1975) determined :

A person in flow has no dualistic perspective: he is aware of his actions but not of the awareness itself. For action to merge with awareness to such an extent, the activity must be feasible. Flow seems to occur only when tasks are within one 's ability to perform. That is why one experiences flow most often in activities with clearly established rules for action, such as rituals, games, or participatory art forms like dance. **(Csikszentmihalyi, 1975, p. 38)**

Dr. Csikszentmihalyi (1975,1993) gave models of flow which were different from each other. The former model consisted of 6 elements namely:

1. The merging of action and awareness
2. A centering of attention on a limited stimulus field
3. A loss of ego or self-consciousness
4. In control of actions and environment
5. Contains coherent demands for action and unambiguous feedback
6. Autotelic nature.

After the initial study, some more research was conducted which found that the participants reported loss of time while experiencing flow. This was usually the case when the challenges and abilities of the participants were balanced. After the continued research, it was found that there were more dimensions of flow which differed from the previous model. This was reported across the chart by American surgeons to Japanese motorcycle riders, to Australian sailors, to Hindu yogi, etc.

The newer elements of flow were:

1. Clear goals with immediate feedback
2. Personal skills and challenge are a match
3. Action and awareness merge
4. Total concentration of the task
5. Sense of potential control
6. Loss of self-consciousness
7. Distorted sense of time
8. The experience becomes autotelic.

It is said that the individual is not aware that he is experiencing flow. The key to the experience of flow is concentration and if there are any distractions, the moment or the state of flow is ruined.

Flow can occur in almost any activity, including singing, dancing, reading, writing, and sculpting (Csikszentmihalyi, 1993; Csikszentmihalyi & Csikszentmihalyi, 1988; Larson, 1988).

Flow is the same as being in the zone that the athletes say while asked to talk about their experience during the game. It is only after the task has been completed that one had the opportunity to reflect and feel the satisfaction and enjoyment that accompanies the flow experience (Csikszentmihalyi, 1993, 1997a). Imagine the consequences if a surgeon would stop in between surgery to experience his feelings of content or what would happen if an Olympic gymnast would think about what he is feeling while on the long board.

Flow at Work

When flow is applied to work situation, it can be defined as short-term peak experience at work that is characterized by absorption, work enjoyment and intrinsic work motivation (Bakker, 2005)

Bakker (2005) further describes :

1. Absorption is a state wherein there is total concentration, and people are fully immersed. **Csikszentmihalyi (1990)** says that time passes quickly, and they forget everything around them.
2. Employees who enjoy their work and feel happy about it make positive judgments about the quality of their working life. (**Veenhoven, 1984**). This enjoyment or happiness is the outcome of cognitive and affective the evaluations of flow evaluations. (**Diener, 2000**)
3. Intrinsic motivation means performing a certain activity with the aim of experiencing inherent pleasure and satisfaction in the activity (**Deci & Ryan, 1985**) They are more involved with the tasks at hand and would want work for longer periods.

Researchers agree that the occurrence of flow is most likely when people perceive a balance between the challenge and their skills to deal with this challenge. (**Clarke & Harworth, 1994; Csikszentmihalyi, 1990**)

For example, if a badminton player is confronted with an opponent who is approximately equally skilled in the game. The game would really be exciting and challenging if both the players had to do their best to beat their opponents. The game can be boring if the opponent is a with fewer skills (low challenge) and a very high stressful game if the opponent is very skillful and much better at the game (high challenge). Using this in the job/work front, workers would experience flow when the job description would match their skills.

Research with the Job Demands-Resources (JD-R) model (**Bakker & Demerouti, 2007; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001**) has shown that job resources make a positive contribution to the engagement and performance of individuals. Moreover, resources such as opportunities for self-development and performance feedback enable employees to better cope with the demands of their work (**Bakker, Demerouti, & Euwema, 2005**).

There is a cultural distinction that if work is enjoyable, then it is not productive (**Csikszentmihalyi, 1975**). The negative attitude towards the work makes the employee feel that the work is a compulsion. Once employees have knowledge of flow and the endless enjoyment that could exist in the workplace. Measuring flow can bring out opportunities for the employees to look forward to and make the most of their time in the workplace.

Flow Assessment

ESM(Experience Sampling Method) is the most common method to measure flow experiences and their frequency. But ESM is mostly used with other flow questionnaires. The Experience Sampling Form is also common to use in conjunction with ESM (**Csikszentmihalyi & Csikszentmihalyi, 1988**)

In 2005, Arnold Bakker developed the WO**rk** re**L**ated Flow Inventory (WOLF) survey forms to easily measure flow at work. This method is a passive collection method which captures the feelings of the participants after the work/activity has been performed.

Both the methods are the most popular methods to measure flow in the working environment. They both involve self-report of feeling and hence are subjective.

ESM Method

The empirical test of flow theory with respect to everyday life experience became possible with the introduction of the ESM (**Csikszentmihalyi et al. 1977; Csikszentmihalyi and Larson 1987**).

The ESM is a measurement method designed to infer the time budget (i.e., the sequence and times in which individuals are in specific states) in everyday life and the associated variation of subjective experience. The ESM seeks a random sampling of the population of experiences with respect to activities and contexts of action and associated subjective feeling (**Moneta,2012**)

ESM aims to measure the subjective experience of the participants at the very moment they experience it and in their natural environment. It is done by randomly giving out questionnaires repeatedly over their daily activities.

The original form of the ESM (**Csikszentmihalyi and Larson 1987**) gathers eight self-reports per day in response to electronic signals randomly generated by pagers that respondents wear for a week. After each signal, participants provide their answers on the experience sampling form (ESF).(**Moneta,2012**)

Csikszentmihalyi (1997) experience sampling studies have shown that people more often experience flow during their work than during free time. That means one has to invest time and energy to experience flow.

It is mentioned in **Moneta (2012)** that the ESF contains 13 categorical items and 29 scaled items. The categorical items serve to reconstruct the activity (main activity, concurrent activities, and content of thought), the context (date, time beeped, time filled out, place, companionship, and influential facts which have occurred since the last pager signal), and some aspects related to motivation and interest (reasons for the activity, sources of physical discomfort, wished activity and companionship and comments).

WOLF Method

As per **Bakker (2007)**, The Work – reLated Flow inventory (WOLF) measures flow at work, defined as short-term peak experience characterized by absorption, work enjoyment, and intrinsic work motivation.

According to **Bakker(2008)** Flow was operationalized with an original set of 16 items. Items were generated by the author and checked for face validity by five organizational psychologists who also gave feedback on writing style. By exploratory factor analyses and reliability analyses, this set was reduced to 13 items. Three flow dimensions are measured, namely absorption (4 items), work enjoyment (4 items), and intrinsic work motivation (5 items). Appendix 1 shows the complete instrument for the measurement of flow at work (the WOLF). Respondents indicated how often they experienced elements of flow on a seven-point scale (1 = never, 7 =

always). The flow experience refers to a short period, i.e., the preceding days or weeks

Bakker's survey form will enable the participants to choose an answer to the question that according to them best fits the situation. As talked earlier the three elements that were studied are absorption, enjoyment and intrinsic motivation.

BIM

BIM is currently the most common denomination for a new way of approaching the design, construction, and maintenance of buildings. It has been defined as "a set of interacting policies, processes and technologies generating a methodology to manage the essential building design and project data in digital format throughout the building's life-cycle" (Succar, 2009: 357).

"A Building Information Model (BIM) is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward. The BIM is a shared digital representation founded on open standards for interoperability." (BuildingSMARTalliance, 2010)

Taking into account the process of Building Information Modeling is methodology to make a high-level, detailed model instead of a traditional model with data scattered across various documents, tables, etc. This method collects and collates data in a single source model so that it could be easily located and retrieved when needed which in turn saves on money and time.

Theoretical developments in Building Information Modelling suggest that not only is it useful for geometric modeling of a building's performance but also that it can assist in the management of construction projects (**Bryde et al., 2012**).

BIM helps the project managers by integrating various stakeholders into the lifecycle of the building. **Arayici et al. (2011)** elaborate on this by forming seven pillars of a BIM implementation strategy: eliminate waste, increase feedback, delay decisions to achieve consensus, deliver fast, build-in integrity, empower the team and see the whole. These likely make a move towards applying lean principles on the construction project easier and more efficient. Owners who are BIM-educated and -sophisticated are usually more engaged with its implementation and able to reap the highest business value (McGraw-Hill Construction 2012a).

BIM - Talent Acquisition and Retention

As building information modeling (BIM) is rapidly reshaping the architecture, engineering, and construction (AEC) industry, profound transformations have taken place in companies' organizational structures as well as their business operations. (**Wu et al., n.d.**)

Amid this transformation, the companies are interested in how to align the intellectual preparation for the challenges and opportunities that may arise due to this newer technology. AEC Companies have an urge to be competitive through efficient talent acquisition.

Many industry professionals and research scholars have observed that BIM-savvy people will be in high demand and the lack of adequately trained personnel is hindering the further BIM uptake in the industry. Thus, it becomes a critical mission for companies to align human resources with organizational development challenges and understand the need for BIM talent, finding it and then placing employees properly within the existing system (Joseph 2011). After this comes the question of maintaining the employee in the system understanding the value of the employee and giving proper guidance and motivation.

BIM is "transformative," meaning that there is impetus for dramatic changes in the business practices (Jordani 2008, Mihindu and Arayici 2008). Companies are urged to manage change (operational and cultural, according to Smith and Tardif (2009) and transition (Deutsch 2011) to carry BIM implementation strategy through and foster its development.

New job titles prefixed with "BIM," e.g. "BIM Manager" and "BIM Coordinator," and the advent of new organizational function units such as "BIM/VDC department" reflect the impetus to rethink the profiling and planning of workforce-oriented to BIM tasks. **(Wu et al., n.d.)**

According to Wu(n.d.), a majority of the companies would put their BIM talent in an existing department and assemble them for project-based BIM tasks. But with the emergence of new functional units such as BIM department, many companies started organizational shifts which would help facilitate the talent.

The demand for BIM talent has also been influenced by companies' workforce planning and the incentives that companies have perceived to adopt BIM. It is extremely important to investigate what talent retention and management strategies have been taken by companies to sustain the success of their transformation to BIM. Before that, it is better to understand how the employees performing the daily activities of BIM are doing in the industry.

By understanding the employee's perception of work the HR and managers can optimally utilize their talent and reap the benefits of the advantages provided by BIM and hence obtain productivity growth as expected. Understanding this will enable the HR and managers formulate strategies and work flows to optimally utilize the BIM talent acquired.

III – Methodology

Introduction

There are two methods to measure flow one is the ESM (Experience Sampling Method), and the other is WOLF (WOrk Related Flow Inventory). ESM method requires a lot of time as the individuals need to be approached personally and explained what they need to do. This study is constrained by time available and hence will be using the WOLF method to measure flow among the BIM Users. WOLF measures flow by focusing on motivation, absorption and work-related enjoyment.

Research Participants

The research participants will be the people who work in the BIM/VDC department of a construction company. It is also possible that many companies do not have a separate named department, so people performing modeling related activities in these companies are also considered as participants. The role of participants can range from BIM/VDC modeler, BIM/VDC Engineer, BIM Manager, BIM Co-coordinator, etc. It should be noted that all the members are at least 18 years of age and have been working in the construction industry in some capacity.

Survey Setting

The research setting was the natural office/working environment of the respondents. While measuring flow it is necessary to understand that the participants are being tested in the environment which they usually work in. The

survey was sent to medium-large scale companies who have in-house BIM/VDC department, and hence for majority of the respondents, the survey setting was the headquarter / office. To keep the setting of the respondents similar, the respondents of the surveys were selected from similar scale companies which have VDC/BIM departments.

Survey Instrument

The variable in this study, flow at work, is calculated by the repetitive occurrence of the respondents work enjoyment, motivation, and absorption. Survey Monkey an online survey tool was used to make, distribute and collect the data for the survey. The respondents received a link to the survey which they could fill using their computer or smartphone. The WOLF measures these important dimensions of flow while at work and if the respondent experienced flow within the preceding weeks (Bakker, 2007; Salanova et al. ,2006).

As per previous papers on WOLF measurement, the participants were asked to respond to thirteen statements using 7-point scale (1 = Never, 2= Almost Never, 3= Sometimes, 4=Regularly, 5=Often, 6=Very Often, 7=Always) but after doing some pilot surveys the data was too skewed, and many people chose the middle ground and so in this survey a 5-point scale was used. (1=Never, 2=Seldom, 3= Regularly, 4=Often, 5=Always)

Some questions are asked to understand the personality type of the respondents. The questions aim to understand whether the respondents are inclined more

inclined towards introvert nature or extrovert nature. The score is collected on the scale from Strongly Disagree to Strongly Agree (Strongly Disagree= Very Uncharacteristic/ Untrue, Disagree= Uncharacteristic, Agree = Characteristic, Strongly Agree = Very Characteristic/ True)

Statements about supervisor role, co-worker support and the availability of resources to the employees were also added to the WOLF questionnaire. They were also measured by the same 5-point scale. (1=Never, 2=Seldom, 3= Regularly, 4=Often, 5=Always)

The **Satisfaction with Life Scale(SWLS)** was also added to the assessment to understand how the employees perceive the quality of their lives which makes it easier to understand the relation between the occurrence of flow and the overall life satisfaction. The scores are collected on a scale of 1-5. (1 = Strongly Disagree, 2=Disagree, 3= Neutral, 4=Agree, 5= Strongly Agree)

Questions about Gender, Size of the VDC/BIM Department, No. of years working for the company, Number of people the respondents interact with daily give a general understanding of the respondents. These factors can be the influencing factors of flow as seen in the literature and hence knowing them is necessary.

Response Collection and Survey Distribution

A waiver from the Human Subjects department at UW was obtained before start collection of the data. The process to obtain the waiver included an explanation of

the survey form and all the specifics regarding the survey were provided. As soon as the waiver was obtained the survey forms were sent out.

The survey links were sent via. Emails to the people who worked in the VDC department or are known to do perform an activity in 3-D modeling. A letter explaining the reason behind the survey and the surveyor accompanied the survey. It was also mentioned that no identifying links were collected. Survey Monkey setting was enabled so that the respondents were not identified. This ensured the completed anonymity of the respondents.

Hypothesis

After collecting and processing the primary data Inferential Analysis will be carried out which will help test certain hypothesis, type of analysis tool used is Pearson-r correlation in SPSS-25 software.

Of all the information collected, a regression analysis was done to test the dependence of all the factors (Eg: Supervisor Feedback, Resources Available Co-worker Interaction, People interacted with daily, Size of VDC Department No of years you have worked for the company, Introverted Scale) Since the data was ranged mean values were used for the purpose of regression. The factors having a coefficient less than 0.01 were ignored in the hypothesis testing. This means that there is very little increase in the Flow Value when the values of the selected variable changes keeping the values of the rest of the variables constant

Table 1: Regression analysis results

| | Coefficients | P-value |
|--|---------------------|--------------------|
| Intercept | 1.497002496 | 0.00481012 |
| Supervisor Feedback | 0.21327699 | 0.002323655 |
| Resources Available | -0.609177397 | 0.452147611 |
| Co-worker Interaction | 0.214272273 | 0.004767181 |
| People you interact with daily | -0.001113047 | 0.958316544 |
| Size of VDC Department | 0.00509276 | 0.66430268 |
| No of years you have worked for the company | -0.022528809 | 0.444584 |
| Introvert Scale | 0.136118832 | 0.007941062 |

The dependence is considered significant if it has a P-value of less than 0.05. Since the highlighted factors have a less coefficient and are not significant, they are ignored when it comes to hypothesis testing.

Hypothesis 1: There is no correlation between the occurrence of flow and the supervisor feedback.

Hypothesis 2: There is no correlation between the occurrence of flow and the resources available to them.

Hypothesis 3: There is no correlation between the occurrence of flow and the perceived life satisfaction of the employee.

Hypothesis 4: There is no correlation between the occurrence of flow and the co-worker interaction of the employee.

Hypothesis 5: There is no correlation between the occurrence of flow in the Modeling activity and the introverted nature of the employee.

Hypothesis 6: There is no correlation between the occurrence of flow in the graphic creation and modeling activity and the introverted nature of the employee.

Hypothesis 7: There is no correlation between the occurrence of flow in the clash detection & model co-ordination activity and the introverted nature of the employee.

Hypothesis 8: There is no correlation between the occurrence of flow in the estimation activity and the introverted nature of the employee.

Hypothesis 9: There is no correlation between the occurrence of flow in general in the activities related to BIM and the introverted nature of the employee.

Method of Data Analysis.

Statistical Program for Social Sciences (SPSS) 25.0 software was used to analyze all the data. The mean and median scores for each of the variables were calculated. The calculated scores were then analyzed using Pearson's Co-relation Test (Bivariate). These scores would give us the relation between the flow and the different factors that we considered. The values where the p values are less than 0.05 are considered statistically significant.

Pearson Co-relation

The Pearson's bivariate co-relation measures the strength and direction of linear co-relation between two continuous variables. The result of the Pearson's test is a value r which gives us the value of strength and relation. Pearson is a parametric measure. The outcome of Pearson- r through SPSS will give us three types of information

- The correlation coefficient
- The Significance
- The Sample Size

The correlation is a no. between -1 and +1. The no. tells us the magnitude and the direction of association between the two variables. The magnitude is the strength of correlation. The Closer the no is to -1 or +1 the stronger the correlation. If the correlation is 0 or very close to zero, there is no significant correlation between the two variables. The direction tells us how two variables are related.

IV – Data Analysis

This chapter will present the results obtained from the data analysis of the collected data. Descriptive statistical analysis and inferential statistical analysis will be utilized to present the results. The presentation of analysis of inferential statistical data will be done by using results generated directly from SPSS 25(Statistical Package for the Social Sciences by IBM).

Profile of Respondents

A randomly selected group of targeted respondents consists of that personnel who have working experience in the VDC/ BIM activities in construction.

Out of the 35 emails sent out we got 28 responses to the survey which gives us an 80% reply rate. Out the 28 replies, 25 were males, and 3 were females.

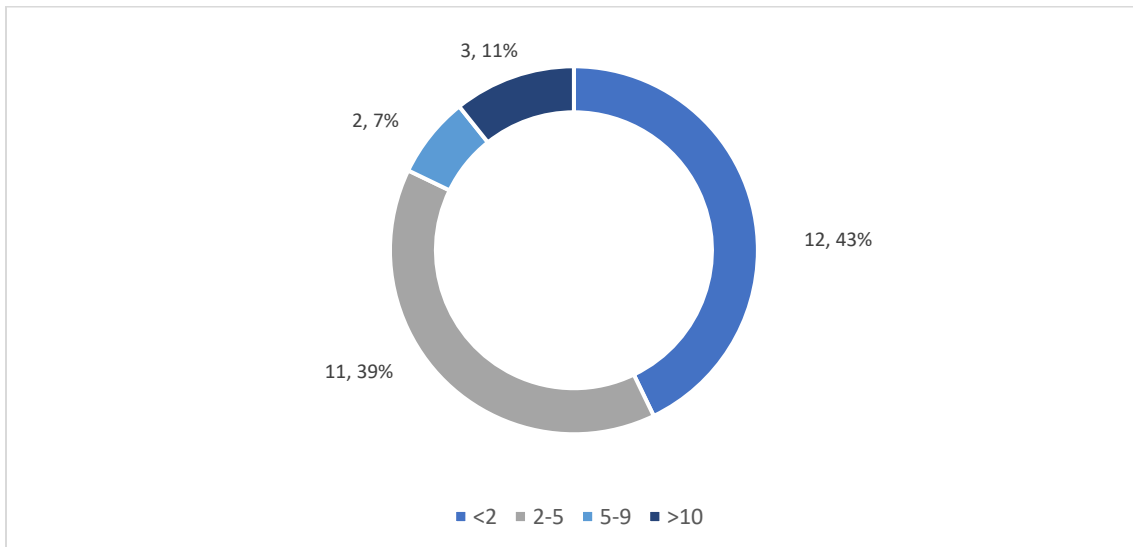


Figure 1: Experience in the construction industry

As seen from the chart above, the majority of the respondents had experience of fewer than five years in the construction industry.

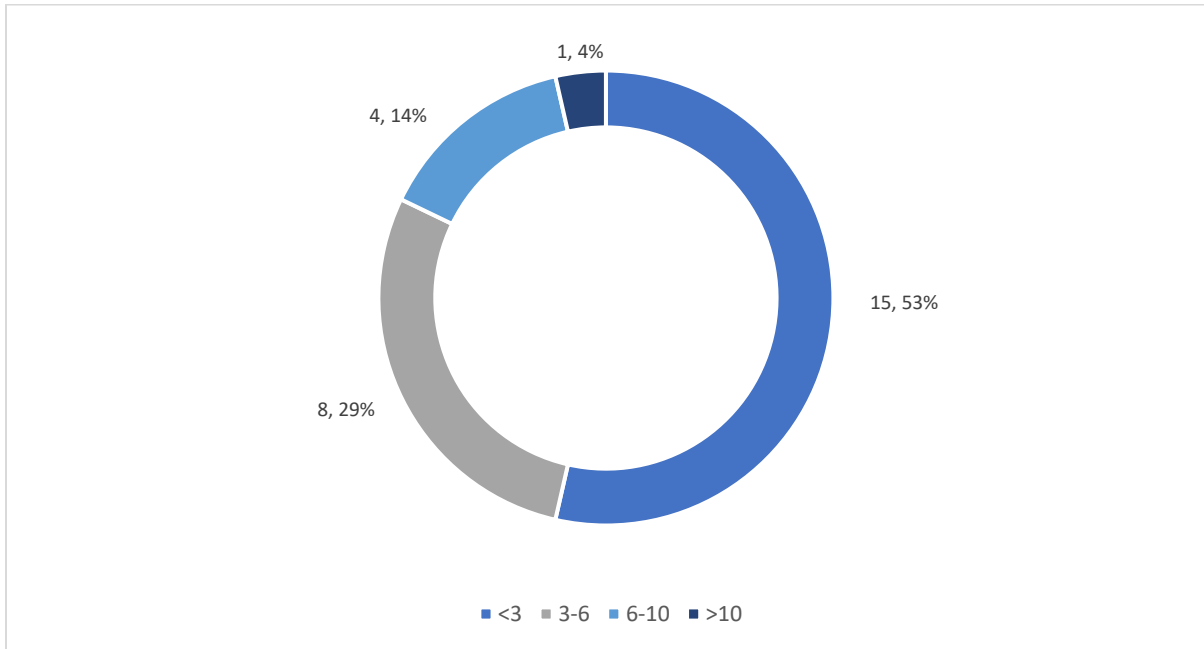


Figure 2: Number of years working for the same company

As seen from the chart above, the majority of the respondents have been in the same company for a long time.

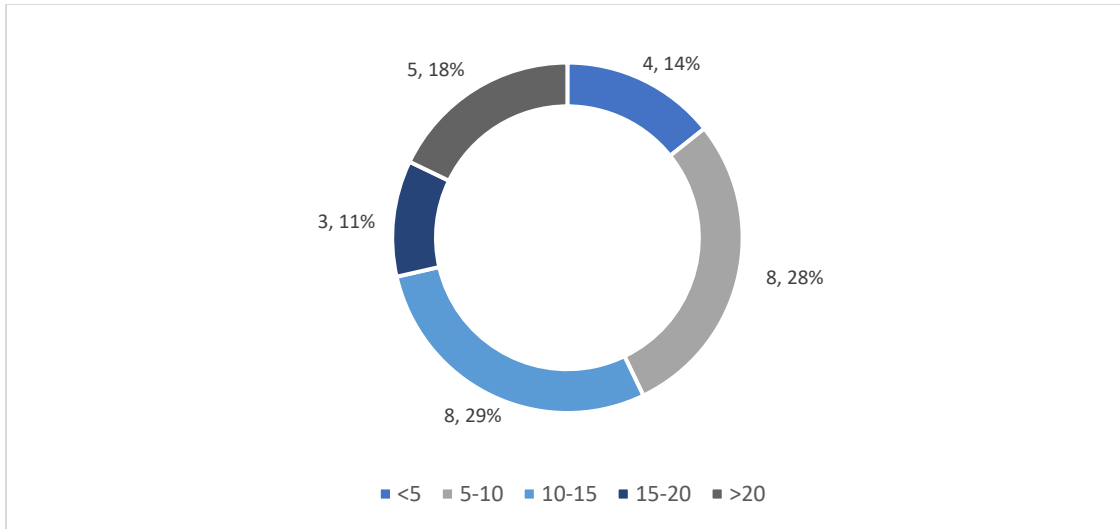


Figure 3: Size of the VDC/BIM Department

The majority of the companies had a VDC/BIM department where more than ten people work.

Flow and Sub-Component Analysis

Mean Results for Flow

Table 2: Flow Results and Individual Means

| | Category | N | Mean |
|--|----------|----|------|
| My work gives me good feeling | WE | 56 | 4.14 |
| I do work with a lot of enjoyment | WE | 56 | 3.98 |
| I feel happy during my work | WE | 56 | 3.93 |
| When I am working I do it for myself | IM | 56 | 3.86 |
| I would do this work even if I received less pay | IM | 56 | 3.84 |
| I feel cheerful when I am working | WE | 56 | 3.73 |
| I work because I enjoy it | IM | 56 | 3.73 |
| I am totally immersed in my work | Ab | 56 | 3.59 |
| I am motivated from the work itself and not from its rewards | IM | 56 | 3.45 |
| When I am working, I forget everything else around me | Ab | 56 | 3.41 |
| I get carried away by my work | Ab | 56 | 3.13 |
| I find that I want to work in my free time | IM | 56 | 2.91 |
| When I am working, I think about nothing else | Ab | 56 | 2.89 |

Ab = Absorption, WE = Work Enjoyment, IM = Intrinsic Motivation ,

Table 3: Overall Flow Results

| Overall Flow | Absorption | Work Enjoyment | Intrinsic Motivation |
|---------------------|-------------------|-----------------------|-----------------------------|
| 3.58 | 3.25 | 3.95 | 3.56 |

As we can see from the table above, the most occurring instances are from Work Enjoyment. My work gives me good feeling, I do work with a lot of enjoyment and I feel happy during my work are ranked the maximum. And the instances of Absorption were ranked the least.

WOLF Reliability

Table 4: Reliability result of the gathered data

| | Cronbach's Alpha | Number |
|----------------------|------------------|--------|
| Overall Flow | 0.853 | 13 |
| Absorption | 0.804 | 4 |
| Work Enjoyment | 0.898 | 4 |
| Intrinsic Motivation | 0.753 | 5 |

The Cronbach's Alpha for overall flow is 0.853 which means the data set is highly reliable. The Cronbach's values for Absorption, Work Enjoyment, and Intrinsic Motivation are 0.804, 0.898 and 0.753 which means the data sets for Absorption and Work Enjoyment are highly reliable whereas the data set for Intrinsic motivation is reliable.

Cronbach's Alpha has a range of 0-1. 0 indicating very poor reliability and 1 indicating that the variables are in complete agreement with each other. A

Cronbach's Alpha value of 0.7 or more is considered acceptable by many scientific institutions.

Overall Flow among BIM practitioners as accessed by WOLF

Table 5: Overall Flow results

| Score | N | Percentage | Cumulative Percentage |
|-------|---|------------|-----------------------|
| 65 | 2 | 5.03% | 100.00% |
| 60 | 3 | 6.96% | 94.97% |
| 57 | 1 | 2.21% | 88.01% |
| 56 | 1 | 2.17% | 85.80% |
| 55 | 1 | 2.13% | 83.64% |
| 54 | 1 | 2.09% | 81.51% |
| 53 | 3 | 6.15% | 79.42% |
| 52 | 2 | 4.02% | 73.27% |
| 51 | 3 | 5.92% | 69.25% |
| 50 | 3 | 5.80% | 63.33% |
| 49 | 5 | 9.48% | 57.52% |
| 48 | 2 | 3.71% | 48.05% |
| 47 | 4 | 7.27% | 44.33% |
| 46 | 3 | 5.34% | 37.06% |
| 45 | 5 | 8.70% | 31.72% |
| 43 | 1 | 1.66% | 23.02% |
| 42 | 1 | 1.62% | 21.35% |
| 41 | 2 | 3.17% | 19.73% |
| 39 | 4 | 6.03% | 16.56% |
| 38 | 1 | 1.47% | 10.52% |
| 37 | 1 | 1.43% | 9.05% |
| 36 | 2 | 2.79% | 7.62% |
| 35 | 1 | 1.35% | 4.84% |
| 34 | 1 | 1.32% | 3.48% |
| 28 | 2 | 2.17% | 2.17% |

The WOLF assessed 13 items on a 5 point Likert Scale. The maximum possible score is 65 and the minimum possible score being 13. A score of 39 or more suggests that the respondent regularly experience flow. Out of all the total 89.48 experience flow regularly to always.

Absorption among BIM practitioners as accessed by WOLF

Table 6: Absorption results

| | | | |
|----|----|--------|---------|
| 20 | 4 | 10.97% | 100.00% |
| 19 | 1 | 2.61% | 89.03% |
| 18 | 1 | 2.47% | 86.42% |
| 17 | 1 | 2.33% | 83.95% |
| 16 | 6 | 13.17% | 81.62% |
| 15 | 2 | 4.12% | 68.45% |
| 14 | 12 | 23.05% | 64.33% |
| 13 | 4 | 7.13% | 41.29% |
| 12 | 5 | 8.23% | 34.16% |
| 11 | 6 | 9.05% | 25.93% |
| 10 | 10 | 13.72% | 16.87% |
| 8 | 1 | 1.10% | 3.16% |
| 7 | 1 | 0.96% | 2.06% |
| 4 | 2 | 1.10% | 1.10% |

The WOLF assessed 4 items on a 5 point Likert Scale. The maximum possible score is 20 and the minimum possible score being 4. A score of 12 or more suggests that the respondent regularly experience flow. Out of all the total 74.07 experience absorption regularly to always. Here comments received indicated that there might not be total immersion in the work, but temporary absorption is a common occurrence

Work Enjoyment among BIM practitioners as accessed by WOLF

Table 7: Work Enjoyment results

| | | | |
|----|----|--------|---------|
| 20 | 11 | 24.89% | 100.00% |
| 19 | 5 | 10.75% | 75.11% |
| 18 | 3 | 6.11% | 64.37% |
| 17 | 3 | 5.77% | 58.26% |
| 16 | 8 | 14.48% | 52.49% |
| 15 | 4 | 6.79% | 38.01% |
| 14 | 8 | 12.67% | 31.22% |
| 13 | 6 | 8.82% | 18.55% |
| 12 | 4 | 5.43% | 9.73% |
| 10 | 3 | 3.39% | 4.30% |
| 8 | 1 | 0.90% | 0.90% |

The WOLF assessed 4 items on a 5 point Likert Scale. The maximum possible score is 20 and the minimum possible score being 4. A score of 12 or more suggests that the respondent regularly experience flow. Out of all the total 95.70 experience work enjoyment regularly to always.

Intrinsic Motivation among BIM practitioners as accessed by WOLF

Table 8: Intrinsic Work Motivation Results

| | | | |
|----|---|--------|---------|
| 25 | 2 | 4.94% | 100.00% |
| 24 | 3 | 7.11% | 95.06% |
| 23 | 3 | 6.82% | 87.94% |
| 22 | 3 | 6.52% | 81.13% |
| 21 | 2 | 4.15% | 74.60% |
| 20 | 9 | 17.79% | 70.45% |
| 19 | 6 | 11.26% | 52.67% |
| 18 | 2 | 3.56% | 41.40% |
| 17 | 6 | 10.08% | 37.85% |
| 16 | 4 | 6.32% | 27.77% |
| 15 | 6 | 8.89% | 21.44% |

| | | | |
|----|---|-------|--------|
| 14 | 5 | 6.92% | 12.55% |
| 13 | 3 | 3.85% | 5.63% |
| 10 | 1 | 0.99% | 1.78% |
| 8 | 1 | 0.79% | 0.79% |

The WOLF assessed 5 items on a 5 point Likert Scale. The maximum possible score is 25 and the minimum possible score being 5. A score of 15 or more suggests that the respondent regularly experience flow. Out of all the total 87.45 are intrinsically motivated regularly to always..

Activity wise Flow Analysis

Modeling Activity

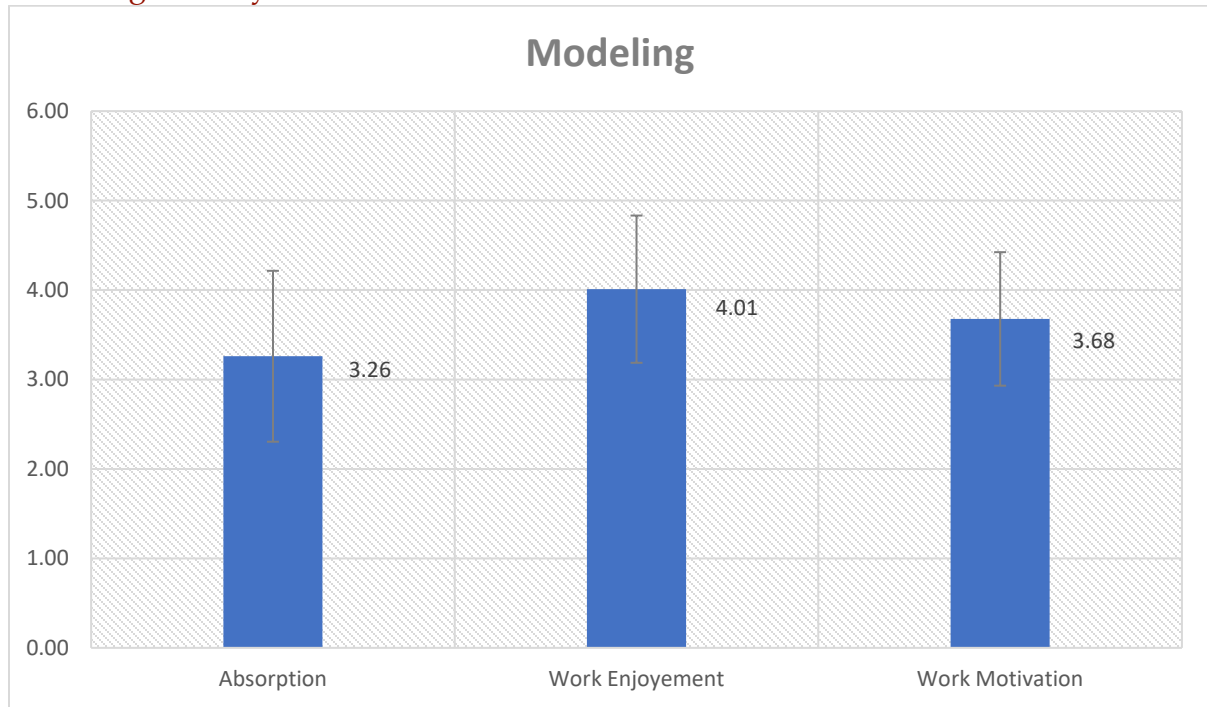


Figure 4: BIM Modeling Sub-component results

Table 9: BIM Modeling deviation and coefficient of variation

| | Absorption | Work Enjoyment | Motivation |
|---------------------------------|-------------------|---------------------------|-------------------|
| St. Dev | 0.96 | 0.82 | 0.75 |
| Coefficient of Variation | 0.29 | 0.21 | 0.20 |

The mean total flow in BIM Modeling is 3.65 and a coefficient of variation of 0.18.

The mean of absorption is 3.26 which means that the employees feel absorbed regularly but less. Work Enjoyment is 4.01 means the employees in the department

enjoy working and motivation is 3.68 meaning the employees are motivated in this activity.

Co-ordination and Clash Detection

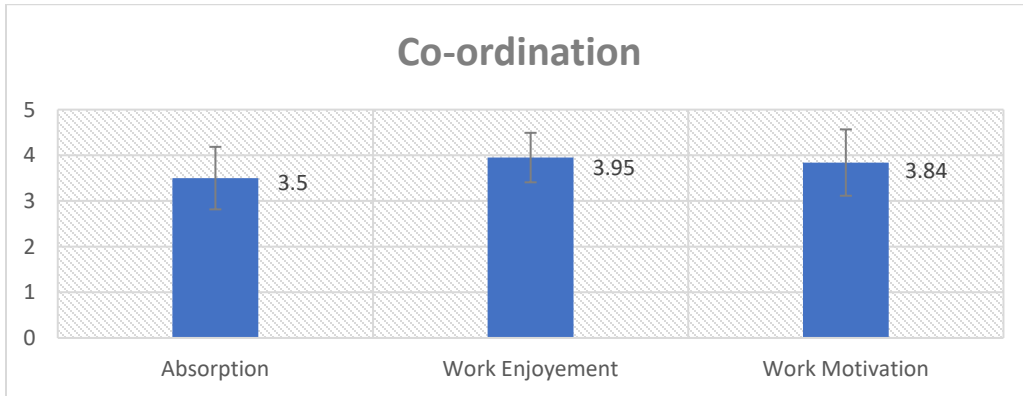


Figure 5: Co-ordination sub-component results

Table 10: Co-ordination Deviation and Coefficient of Variation

| | Absorption | Work Enjoyment | Motivation |
|---------------------------------|-------------------|-----------------------|-------------------|
| St. Dev | 0.68 | 0.54 | 0.73 |
| Coefficient of Variation | 0.20 | 0.14 | 0.19 |

The mean total flow in Co-ordination activities is 3.76 and a coefficient of variation of 0.11. The scores Enjoyment and Motivation are towards the higher side.

Although, the number of respondents is 5 which is not sufficient to conclude. All the components of flow are ranked higher in this activity.

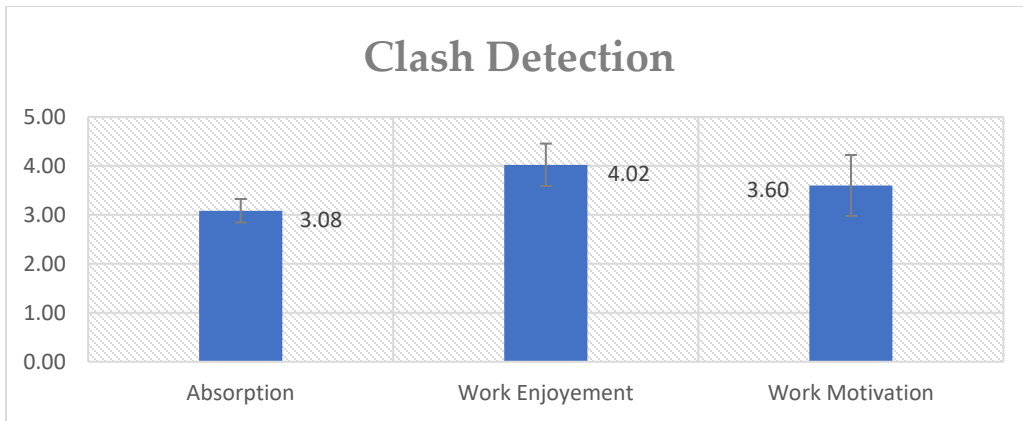


Figure 6: Clash Detection Sub-component results

Table 11: Clash Detection Std. deviation and Co-efficient of Variation

| | Absorption | Work Enjoyment | Motivation |
|---------------------------------|-------------------|-----------------------|-------------------|
| St. Dev | 1.05 | 1.03 | 0.92 |
| Coefficient of Variation | 0.34 | 0.26 | 0.26 |

The mean total flow in Clash Detection activity is 3.57 and a coefficient of variation of 0.21.

The number (N=17) and all 100% of the respondents replied to each of the answers. The value for absorption is towards the lower end. The Work Enjoyment and Intrinsic Motivation is towards a higher end which says that these activities even though are not immersive in nature but are enjoyable and motivating.

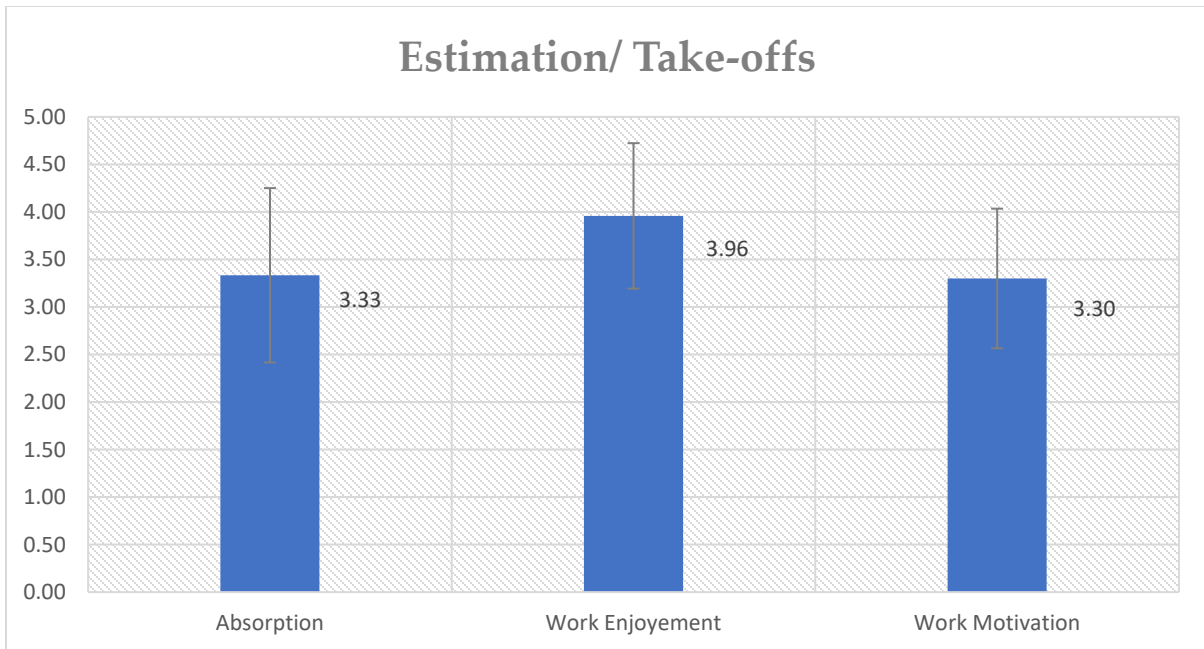


Figure 7: Estimation/QTO Sub-component Results

| | Absorption | Work Enjoyment | Motivation |
|-------------------------------------|-------------------|---------------------------|-------------------|
| St. Dev | 0.92 | 0.77 | 0.73 |
| Coefficient of Variation | 0.28 | 0.19 | 0.22 |

Figure 8: Estimation/ QTO Std. Deviation and Co-efficient of Variation

The mean total flow in BIM Modeling is 3.53 and a coefficient of variation of 0.18. For this activity, the number of respondents is 7 (N=7), and all 100% of the respondents replied to all the questions asked. The value for absorption is a bit towards the lower end. The enjoyment is high, and the Intrinsic Work Motivation is lesser in take-offs as compared to other activities in BIM.

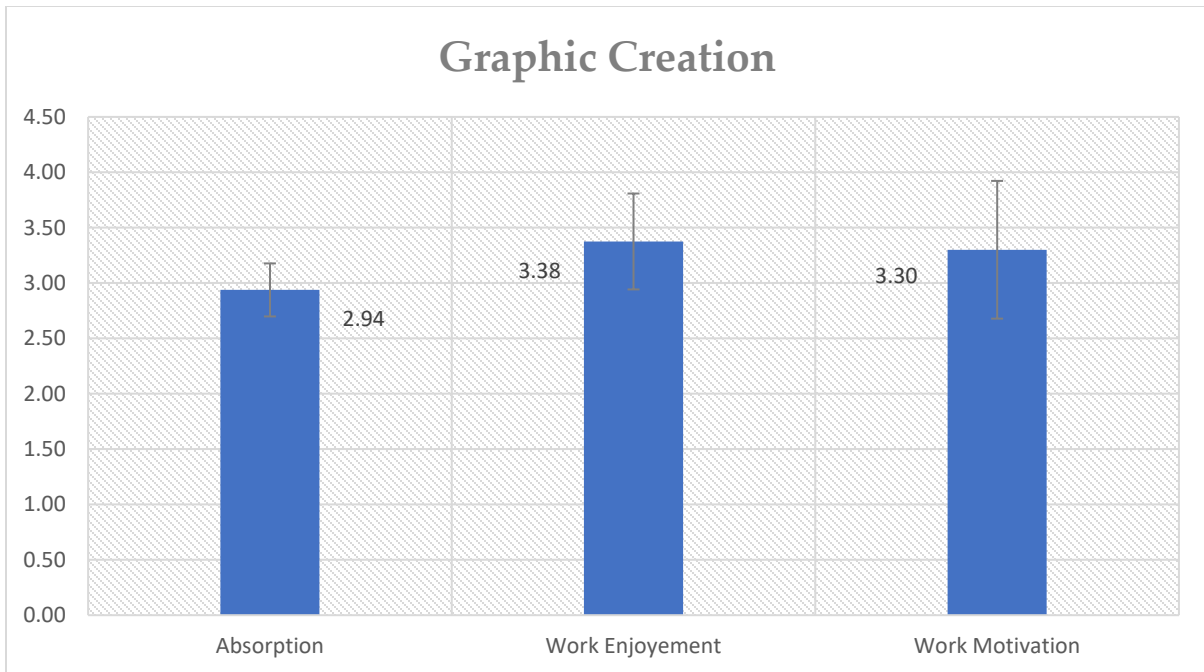


Figure 9: Graphic Creation Sub-component results

Table 12: Graphic Creation Std. deviation and Co-efficient of Variation

| | Absorption | Work Enjoyment | Motivation |
|-------------------------------------|------------|-------------------|------------|
| St. Dev | 0.24 | 0.43 | 0.62 |
| Coefficient of Variation | 0.08 | 0.13 | 0.19 |

The mean total flow in BIM Modeling is 3.20 and a coefficient of variation of 0.11. The number of respondents for this is 5 (N=5) out of which 100% replied to all the questions asked. The value for absorption is lower than 3 meaning that participants don't experience absorption regularly. However, the number of respondents is less and hence strong conclusions cannot be drawn. Overall, all the components of flow are towards the lower side.

Some results for programming, AR/VR creation were not considered in the analysis due to limited respondents (N<5).

Hypothesis Testing

Table 13: Co-relation Results

| Hypothesis | | | Correlation | Significance | Number |
|---------------------|---------------------------------|---------------------------------------|----------------|--------------|-----------|
| Hypothesis 1 | Total Flow | Supervisor Feedback | 0.627** | 0 | 56 |
| Hypothesis 2 | Total Flow | Resource Availability | 0.172 | 0.204 | 56 |
| Hypothesis 3 | Total Flow | Satisfaction of Life | 0.324 | 0.093 | 28 |
| Hypothesis 4 | Total Flow | Co-worker Interaction | 0.484** | 0 | 56 |
| Hypothesis 5 | Flow in BIM Modeling | Introverted Nature of employee | 0.561** | 0.004 | 25 |
| Hypothesis 6 | Flow – Graphic Creation | Introverted Nature of employee | 0.004 | 0.994 | 5 |
| Hypothesis 7 | Flow – Clash Detection | Introverted Nature of employee | 0.321 | 0.209 | 17 |
| Hypothesis 8 | Flow – Take-offs | Introverted Nature of employee | 0.818* | 0.024 | 7 |
| Hypothesis 9 | Flow – Activities in BIM | Introverted Nature of employee | 0.627* | 0 | 56 |

* Correlation is significant at the 0.05 level

** Correlation is significant at the 0.01 level

Hypothesis Results

Hypothesis 1: There is a **significant correlation** between the occurrence of flow and the supervisor feedback.

Hypothesis 2: There is **no significant correlation** between the occurrence of flow and the resources available to them.

Although it must be noted that majority of the respondents in question here belong to a medium-large sized company and work at the home office. Being in such a position they have all the resources available to them. This creates a data set with an only positive value for resource availability. Hence concrete conclusions cannot be drawn from this analysis.

Hypothesis 3: There is **no significant correlation** between the occurrence of flow and the perceived life satisfaction of the employee.

Here the employees all reported that they are satisfied with their life with a mean value of 3.68. Giving out only positive high data sets hence a concrete conclusion cannot be drawn from this data.

Hypothesis 4: There is a **significant correlation** between the occurrence of flow and the co-worker interaction of the employee

Hypothesis 5: There is a **significant correlation** between the occurrence of flow in the Modeling activity and the introverted nature of the employee.

Hypothesis 6: There is **no significant correlation** between the occurrence of flow in the graphic creation and modeling activity and the introverted nature of the employee.

Here the number of respondents is very less $N=5$, and hence the analysis needs more data to be proven.

Hypothesis 7: There is **no significant correlation** between the occurrence of flow in the clash detection & model co-ordination activity and the introverted nature of the employee.

Hypothesis 8: There is a **significant correlation** between the occurrence of flow in the estimation activity and the introverted nature of the employee.

Here the number of respondents is very less $N=7$, and hence the analysis needs more data to be proven.

Hypothesis 9: There is a **significant correlation** between the occurrence of flow in the general activities of BIM and the introverted nature of the employee

V – Conclusions & Recommendations

This study was aimed towards examining the work engagement of the BIM industry practitioners. This was done by measuring the three aspects namely work absorption, work enjoyment and intrinsic motivation. A concept called flow and the WOLF survey created by Arnold Bakker was used to measure and understand work engagement. Overall in the BIM work done for the construction industry. Work Enjoyment (**M= 3.95, SD= 0.169, CV = 0.04**) was the most occurring following Intrinsic Work Motivation (**M=3.56, SD=0.039, CV=0.11**) and then absorption (**M= 3.25, SD= 0.307, CV=0.09**). It was found statistically that among them BIM has an overall good flow occurrence (**M= 3.58, SD =0.21, CV =0.06**) and more than 85% of the respondent's experience flow regularly to some degree. The correlation testing is done also revealed that flow is highly dependent on the degree of coworker interaction and supervisor feedback on the work. It was also revealed that introverted employees have a much deeper liking towards activities related to BIM especially Modeling and the estimation activities.

This study also concluded that supervisor feedback has an impact on the overall employee flow, i.e., the people who receive regular feedback on their performance will be more motivated and energetic in working. If their managers provide such feedback on a frequent basis, then the employees have a better understanding of what is expected from their role and the improvements that are needed. Both negatives and positive feedback are important to discuss the overall growth of the employee and hence the company.

Participants who interact with their co-workers on a regular basis and can talk about their ideas on a regular basis experience more flow. This is because

primarily the positions of the employees, in this survey especially, is based in the office environment which enables them to gel, share their knowledge and learn from one another and work as a team which makes them want to come to the office and work more.

It is also observed that employees who have a bad life situation or who are not in general satisfied with their life do not enjoy their work life because they may be distracted. This is an important type of knowledge that could help a supervisor decide which employees need help. And This study could not draw conclusions, or any correlation between employees flow and their satisfaction in life as most of the staff replied positively on the Satisfaction with Life Scale questions (SWS).

Table 14: Overall Flow and Sub-Component Summary

| | BIM | Modeling | Co-ordination | Estimation | Graphic Creation | Clash Detection |
|----------------------------------|-------------|-------------|---------------|-------------|------------------|-----------------|
| Overall | 3.61 | 3.65 | 3.76 | 3.53 | 3.20 | 3.57 |
| SD | 0.56 | 0.66 | 0.43 | 0.63 | 0.34 | 0.76 |
| CV | 0.16 | 0.18 | 0.11 | 0.18 | 0.11 | 0.21 |
| Absorption | 3.25 | 3.26 | 3.50 | 3.33 | 2.94 | 3.08 |
| SD | 0.77 | 0.96 | 0.68 | 0.92 | 0.24 | 1.05 |
| CV | 0.24 | 0.29 | 0.20 | 0.28 | 0.08 | 0.34 |
| Work Enjoyment | 3.95 | 4.01 | 3.95 | 3.96 | 3.38 | 4.02 |
| SD | 0.72 | 0.82 | 0.54 | 0.77 | 0.43 | 1.03 |
| CV | 0.18 | 0.21 | 0.14 | 0.19 | 0.13 | 0.26 |
| Intrinsic Work Motivation | 3.63 | 3.68 | 3.84 | 3.30 | 3.30 | 3.60 |
| SD | 0.75 | 0.75 | 0.73 | 0.73 | 0.62 | 0.92 |
| CV | 0.21 | 0.20 | 0.19 | 0.22 | 0.19 | 0.26 |

Overall when tested overall 89.48 % of the people practicing BIM experience to some extent regularly the average score obtained was 3.61 the cutoff of flow was taken at 3.00.

As we can see from the table the activity of graphic creation has the lowest score of all the possible tested activities. This can be partly because people engaged in graphic creation are not responsible for more difficult and challenging work which may have a deeper impact on the overall project success. Even in such a scenario the work enjoyment factor is the most frequently occurring and absorption the least which is also true for all the other cases.

The overall average of the co-ordination activity is the highest. This may be because the people performing the co-ordination activities spend most of the time talking with other people, and their work results will have an immediate effect on the overall project health. Adhering to deadlines and also having something to report also takes extra effort and so they have to be more involved with their work as they have people who need immediate answers. Also here the same trend is observed as all the other activities that Work Enjoyment is more than absorption and Intrinsic Work Motivation.

In BIM Modeling, the Work Enjoyment is found to be the highest among all the activities even though the overall flow is lower. This may be due to the reason that people get to work on interesting projects which provide a good challenge to create something which they have never before done. The less amount of repetition of work can be a major reason that the employees find this work most enjoyable.

Suggestions

In order to make sure that the employees are working at their full capacity ie. efficiently they need to experience more flow. This can be achieved by regularly accessing and understanding the employee needs. This can also be achieved through a simple dialogue with the employee but in order to know exactly which factor, ie. Absorption, Work enjoyment, and Intrinsic Work Motivation need more focus methods like flow study should be regularly done and based on that specific steps can be taken.

1. Managers should have weekly discussions meeting which creates better communication and team building which would increase co-worker interaction.
2. Managers can also extent idea sharing invitation by means of emails, written forms, and staff manuals.
3. Managers should be prompt and timely in providing feedback and expectations.
4. It is critical for managers to evaluate the current workload and employee skill set.
5. Measuring the flow and aptitude can also help the managers better understand the need to cycle through activities in the BIM department giving the employee an overall experience which would keep them interested and more engaged.
6. Managers can prepare the employee for the next available promotions and coach and guide them through it.

Limitations and Future Scope

1. A major limitation of this study was the limited time available. Had more time been available the study could have employed the ESM technique which may have yielded better and accurate results. Although WOLF is also a very similar to this popular method to gather data employed in many fields such as work engagement, burnout, etc.
2. A clear definition of employees was missing. In order to gather more surveys the survey was sent to employees doing BIM in every aspect. Rather than that only employees doing BIM/4-D modeling as their primary and only activity could be studied.

3. Flow being a very subjective and in the moment occurrence it is very difficult to accurately collect and record flow-related data.
4. The number of participants in this study was also less than expected.
5. The study was of full-time employees only it would be interesting to know how part-time employees especially interns perceive this job which can help managers attract more talent into this upcoming and important part of the construction industry.
6. The definitions of the activities were not defined
7. The other limitation of this survey was that the respondents were asked to fill the same set of questions for two different activities that they perform. This could influence the results. It would be interesting to know how the results are when each person gives their response on only one activity.

References

- Azhar, Salman. 2011. "Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry." *Leadership and Management in Engineering* 11 (3): 241–252.
- Azhar, Salman, Abid Nadeem, Johnny YN Mok, and Brian HY Leung. 2008. "Building Information Modeling (BIM): A New Paradigm for Visual Interactive Modeling and Simulation for Construction Projects." In *Proc., First International Conference on Construction in Developing Countries*, 1:435–446.
- Bakker, Arnold B. 2005. "Flow among Music Teachers and Their Students: The Crossover of Peak Experiences." *Journal of Vocational Behavior* 66 (1): 26–44. <https://doi.org/10.1016/j.jvb.2003.11.001>.
- Bakker, Arnold B. 2008. "The Work-Related Flow Inventory: Construction and Initial Validation of the WOLF." *Journal of Vocational Behavior* 72 (3): 400–414. <https://doi.org/10.1016/j.jvb.2007.11.007>.
- Bakker, Arnold B., and Marianne van Woerkom. 2017. "Flow at Work: A Self-Determination Perspective." *Occupational Health Science* 1 (1–2): 47–65. <https://doi.org/10.1007/s41542-017-0003-3>.
- Bakker, Arnold, Tajana Ljubin Golub, and Majda Rijavec. 2017. "Validation of the Study-Related Flow Inventory (WOLF-S) / Validacija Inventara Zanesenosti U Studiranju (WOLF-S)." *Croatian Journal of Education - Hrvatski Časopis Za Odgoj I Obrazovanje* 19 (1). <https://doi.org/10.15516/cje.v19i1.2194>.
- Barlish, Kristen, and Kenneth Sullivan. 2012. "How to Measure the Benefits of BIM — A Case Study Approach." *Automation in Construction* 24 (July): 149–59. <https://doi.org/10.1016/j.autcon.2012.02.008>.
- Becerik-Gerber, Burcin, David J. Gerber, and Kihong Ku. 2011. "The Pace of Technological Innovation in Architecture, Engineering, and Construction Education: Integrating Recent Trends into the Curricula." *Journal of Information Technology in Construction (ITcon)* 16 (24): 411–432.
- Bryde, David, Martí Broquetas, and Jürgen Marc Volm. 2013. "The Project Benefits of Building Information Modelling (BIM)." *International Journal of Project Management* 31 (7): 971–80. <https://doi.org/10.1016/j.ijproman.2012.12.001>.

- Chong, Heap-Yih, Cen-Ying Lee, and Xiangyu Wang. 2017. "A Mixed Review of the Adoption of Building Information Modelling (BIM) for Sustainability." *Journal of Cleaner Production* 142 (January): 4114–26. <https://doi.org/10.1016/j.jclepro.2016.09.222>.
- Contagion, Primitive Emotional. n.d. "Emotional Contagion and Empathy."
- "Csikszentmihalyi, M. (1999). If We Are so Rich, Why Aren't We Happy? *American Psychologist*, 54(10), 821-827." n.d.
- Csikszentmihalyi, M., and J. LeFevre. 1989. "Optimal Experience in Work and Leisure." *Journal of Personality and Social Psychology* 56 (5): 815–22.
- Csikszentmihalyi, Mihaly. 1993. *The Evolving Self: A Psychology for the Third Millennium*. 1st ed. New York, NY: HarperCollins Publishers.
- Csikszentmihalyi, Mihaly. , ed. 1995. *Optimal Experience: Psychological Studies of Flow in Consciousness*. Cambridge: Cambridge University Press.
- Csikszentmihalyi, Mihaly. 1997a. *Finding Flow: The Psychology of Engagement with Everyday Life*. 1st ed. MasterMinds. New York, NY: Basic Books.
- Csikszentmihalyi, Mihaly. 1997b. "Happiness and Creativity." *The Futurist* 31 (5): S8.
- Csikszentmihalyi, Mihaly. 2009. *Flow: The Psychology of Optimal Experience*. Nachdr. Harper Perennial Modern Classics. New York: Harper [and] Row.
- . 2013. *Creativity: The Psychology of Discovery and Invention*. 1. ed. Modern Classics. New York: Harperperennial.
- Doumbouya, Lancine, Guoping Gao, and Changsheng Guan. 2016. "Adoption of the Building Information Modeling (BIM) for Construction Project Effectiveness: The Review of BIM Benefits." *American Journal of Civil Engineering and Architecture* 4 (3): 74–79.
- Fee, J. A., and W. D. Phillips. 1975. "The Behavior of Holo- and Apo-Forms of Bovine Superoxide Dismutase at Low pH." *Biochimica Et Biophysica Acta* 412 (1): 26–38.
- Ghaffarianhoseini, Ali, John Tookey, Amirhosein Ghaffarianhoseini, Nicola Naismith, Salman Azhar, Olia Efimova, and Kaamran Raahemifar. 2017. "Building Information Modelling (BIM) Uptake: Clear Benefits, Understanding Its Implementation, Risks and Challenges." *Renewable and Sustainable Energy Reviews* 75 (August): 1046–53. <https://doi.org/10.1016/j.rser.2016.11.083>.
- Hogaboam, Allison Maria. 2010. "Flow at Work among Part-Time Municipal Recreation Staff." PhD Thesis, California State University, Long Beach.

Inguva, Girija. 2014. "Differences for Employees Who Use BIM/VDC in the Construction Workplace." PhD Thesis, Colorado State University.

Larson, Reed, and Mihaly Csikszentmihalyi. 2014. "The Experience Sampling Method." In *Flow and the Foundations of Positive Psychology*, by Mihaly Csikszentmihalyi, 21–34. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-017-9088-8_2.

"Life Satisfaction Scale.pdf." n.d.

Matarneh, Rana T, and Sadeq A Hamed. 2017. "Exploring the Adoption of Building Information Modeling (BIM) in the Jordanian Construction Industry." *Journal of Architectural Engineering Technology* 6 (1). <https://doi.org/10.4172/2168-9717.1000189>.

Nakamura, Jeanne, and Mihaly Csikszentmihalyi. 2014. "The Concept of Flow." In *Flow and the Foundations of Positive Psychology*, 239–263. Springer.

Rui, H. E., X. U. Li-Feng, Kai-Lang HUANG, H. U. Fang-Qiao, W. E. N. Jian, and G. U. Jia-Ning. 2017. "Top-Notch Talent BIM Education Based on Program of Innovation and Entrepreneurship." *DEStech Transactions on Social Science, Education and Human Science*, no. esem.

Sacks, R and Barak, R (2010) Teaching Building Information Modeling as an Integral Part of Freshman Year Civil Engineering Education. "Journal of Professional Issues in Engineering Education and Practice", 136(1), 30-8.

Sahil, Abdul Qadeer. 2016. "Adoption of Building Information Modeling in Developing Countries: A Phenomenological Perspective." PhD Thesis, Colorado State University.

Schaufeli, Wilmar B., and Arnold B. Bakker. 2010. "Defining and Measuring Work Engagement: Bringing Clarity to the Concept." *Work Engagement: A Handbook of Essential Theory and Research*, 10–24.

Silverio, A. K., S. Suresh, S. Renukkapa, and D. Heesom. n.d. "BIM Education Framework for Clients and Professionals of the Construction Industry."

Smith, D and Tardif, M (2009) "Building Information Modelling: A Strategic Implementation Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers". Hoboken, New Jersey: John Wiley & Sons, Inc.

Smith, R. J., and R. G. Bryant. 1975. "Metal Substitutions Incarbonic Anhydrase: A Halide Ion Probe Study." *Biochemical and Biophysical Research Communications* 66 (4): 1281–86.

Spurlin, Sam, and Mihaly Csikszentmihalyi. 2017. “WILL WORK EVER BE FUN AGAIN?” *Flow at Work: Measurement and Implications*, 176.

Sukumar, Mr D., and Mr V. Rajesh Kumar. n.d. “A STUDY OF VARIOUS FACTORS AFFECTING LABOUR PRODUCTIVITY IN ROAD CONSTRUCTION AND SUGGESTIONS TO IMPROVE IT.”

Suwal, S., P. Jävämä, Md A. Rahman, and V. Gonzalez. 2013. “Exploring BIM-Based Education Perspectives.” *AUBEA–2013*.

Van Ittersum, Kyle William. 2015. *The Distinctiveness of Engagement and Flow at Work*. Kansas State University.

Vittersø, Joar, Marit Vorkinn, and Odd Inge Vistad. 2001. “Congruence between Recreational Mode and Actual behavior—A Prerequisite for Optimal Experiences?” *Journal of Leisure Research* 33 (2): 137–159.

Wu, Wei, and Raja RA Issa. 2013. “Impacts of BIM on Talent Acquisition in the Construction Industry.” In *Proc., 29th Annual ARCOM Conference*, 35–45.

Wu, Wei, and RR ISSA. 2014. “THE SOFT SIDE OF BIM: CURRENT PRACTICE OF BIM TALENT ACQUISITION IN THE AEC INDUSTRY.” In *Building Innovation 2014-BIM Academic Symposium: Advancing BIM in the Curriculum*.

Appendix

Thesis Survey Questionnaire

Survey Data

1. Gender

- Male
- Female

2. No. of years working in the BIM department

- <2
- 2-5
- 5-8
- 8-10
- >10

3. Size of the VDC/BIM department

- <5
- 5-10
- 10-15
- 15-20
- >20

4. No. of years you have worked for the company

- < 3
- 3-6
- 6-10
- >10

5. The number of people you interact with daily

- < 3
- 3 - 6
- 6 - 10
- > 10

6. Please answer the following about yourself

| | Very uncharacteristic or untrue, strongly disagree | Uncharacteristic, disagree | Characteristic, agree | Very characteristic or true, strongly agree |
|--|--|----------------------------|-----------------------|---|
| I do my best work in a quiet environment. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| In large social gatherings, I often feel a need to seek out space to be by myself. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| In my free time, I would like to be around people. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

7. Please indicate the following about your life in general

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I'm satisfied with my life | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| My life conditions are excellent | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If I could live over, I would change nothing | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| So far I have gotten the important things I want in life | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| In most ways my life is close to ideal | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

8. Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.)

1

2

9. Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions.

| | Never | Seldom | Regularly | Often | Always |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| When I am working, I think about nothing else | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I get carried away by my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| When I am working, I forget everything else around me | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Never | Seldom | Regularly | Often | Always |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I am totally immersed in my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| My work gives me good feeling | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I do work with a lot of enjoyment | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel happy during my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel cheerful when I am working | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I find that I want to work in my free time | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I work because I enjoy it | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| When I am working I do it for myself | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often do your supervisors provide clear goals and feedback on your work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would do this work even if I received less pay | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often do you feel you have the supplies and resources you need for your program to be successful | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am motivated from the work itself and not from its rewards | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often are you able to talk with your coworkers about the work ideas that you have. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

10. Think about the time when you performed the activity ranked 2 please answer the following questions.

| | Never | Seldom | Regularly | Often | Always |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| When I am working, I think about nothing else | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I get carried away by my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | Never | Seldom | Regularly | Often | Always |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| When I am working, I forget everything else around me | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am totally immersed in my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| My work gives me good feeling | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I do work with a lot of enjoyment | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel happy during my work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel cheerful when I am working | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I find that I want to work in my free time | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I work because I enjoy it | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| When I am working I do it for myself | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often do your supervisors provide clear goals and feedback on your work | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would do this work even if I received less pay | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often do you feel you have the supplies and resources you need for your program to be successful | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I am motivated from the work itself and not from its rewards | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| How often are you able to talk with your coworkers about the work ideas that you have. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| Respondent ID | | 6661146821 | 6661145165 | 6661142247 | 6660099808 | 6659787860 |
|---|--|-----------------------|---|---|--|---|
| Gender | Gender | Male | Female | Male | Female | Male |
| No. of years working in the BIM department | | <2 | 2-5 | >10 | 2-5 | <2 |
| Size of the VDC/BIM department | | >20 | 10-15 | 5-10 | 5-10 | >20 |
| No. of years you have worked for the company | | <3 | 6-10 | 6-10 | 3-6 | <3 |
| The number of people you interact with daily | | >10 | 6 - 10 | 3 - 6 | 3 - 6 | >10 |
| Please answer the following about yourself | | | | | | |
| | I do my best work in a quiet environment. | Characteristic, agree | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree | Uncharacteristic, disagree | Very characteristic or true, strongly agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Characteristic, agree | Very characteristic or true, strongly agree | Characteristic, agree | Very uncharacteristic or untrue, strongly disagree | Characteristic, agree |
| | In my free time, I would like to be around people. | Characteristic, agree | Very characteristic or true, strongly agree | Uncharacteristic, disagree | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree |
| Please indicate the following about your life in general | | | | | | |
| | I'm satisfied with my life | Strongly Agree | Neutral | Strongly Disagree | Neutral | Strongly Agree |
| | My life conditions are excellent | Agree | Neutral | Disagree | Agree | Strongly Agree |
| | If I could live over, I would change nothing | Neutral | Agree | Neutral | Agree | Agree |
| | So far I have gotten the important things I want in life | Disagree | Agree | Disagree | Neutral | Neutral |
| | In most ways my life is close to ideal | Strongly Disagree | Strongly Agree | Neutral | Neutral | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | | |
| | 1 | BIM Modeling | 4-D Modeling | BIM Modeling | BIM Modelling | Clash detection |
| | 2 | clash detection | Model based estimation | clash detection | Proposal Graphics | Site Utilities |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | | |
| | When I am working, I think about nothing else | Never | Often | Always | Regularly | Never |
| | I get carried away by my work | Seldom | Regularly | Seldom | Seldom | Seldom |
| | When I am working, I forget everything else around me | Regularly | Always | Often | Seldom | Regularly |
| | I am totally immersed in my work | Often | Often | Regularly | Regularly | Often |
| | My work gives me good feeling | Always | Always | Seldom | Always | Always |
| | I do work with a lot of enjoyment | Often | Always | Regularly | Often | Always |
| | I feel happy during my work | Regularly | Always | Regularly | Often | Often |
| | I feel cheerful when I am working | Seldom | Often | Often | Often | Often |
| | I find that I want to work in my free time | Never | Often | Regularly | Often | Seldom |
| | I work because I enjoy it | Seldom | Often | Always | Always | Always |
| | When I am working I do it for myself | Regularly | Often | Always | Often | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Regularly | Often | Often | Often |
| | I would do this work even if I received less pay | Always | Often | Regularly | Regularly | Always |
| | How often do you feel you have the supplies and resources you need for your | Often | Seldom | Often | Often | Always |
| | I am motivated from the work itself and not from its rewards | Regularly | Often | Regularly | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Seldom | Always | Often | Often | Always |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | | |
| | When I am working, I think about nothing else | Seldom | Always | Often | Regularly | Never |
| | I get carried away by my work | Regularly | Always | Regularly | Seldom | Seldom |
| | When I am working, I forget everything else around me | Often | Always | Often | Seldom | Regularly |
| | I am totally immersed in my work | Always | Always | Regularly | Regularly | Often |
| | My work gives me good feeling | Often | Often | Often | Always | Always |
| | I do work with a lot of enjoyment | Regularly | Often | Regularly | Often | Always |
| | I feel happy during my work | Seldom | Regularly | Often | Often | Often |
| | I feel cheerful when I am working | Never | Often | Never | Often | Often |
| | I find that I want to work in my free time | Seldom | Regularly | Often | Often | Seldom |
| | I work because I enjoy it | Regularly | Regularly | Regularly | Always | Always |
| | When I am working I do it for myself | Often | Regularly | Often | Often | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Always | Often | Regularly | Often | Often |
| | I would do this work even if I received less pay | Often | Often | Often | Regularly | Always |
| | How often do you feel you have the supplies and resources you need for your | Regularly | Regularly | Regularly | Often | Always |
| | I am motivated from the work itself and not from its rewards | Seldom | Often | Often | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Never | Regularly | Regularly | Often | Always |

| Respondent ID | | 6649066980 | 6647586355 | 6647583917 | 6644859328 |
|---|--|---|---|--|---|
| Gender | Gender | Male | Male | Male | Male |
| No. of years working in the BIM department | | 2-5 | <2 | <2 | <2 |
| Size of the VDC/BIM department | | 15-20 | <5 | <5 | >20 |
| No. of years you have worked for the company | | 3-6 | 3-6 | 3-6 | < 3 |
| The number of people you interact with daily | | 3 - 6 | 3 - 6 | > 10 | 6 - 10 |
| Please answer the following about yourself | | | | | |
| | I do my best work in a quiet environment. | Very characteristic or true, strongly agree | Characteristic, agree | Characteristic, agree | Uncharacteristic, disagree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Very characteristic or true, strongly agree | Characteristic, agree | Very uncharacteristic or untrue, strongly disagree | Uncharacteristic, disagree |
| | In my free time, I would like to be around people. | Uncharacteristic, disagree | Characteristic, agree | Characteristic, agree | Very characteristic or true, strongly agree |
| Please indicate the following about your life in general | | | | | |
| | I'm satisfied with my life | Agree | Agree | Agree | Strongly Agree |
| | My life conditions are excellent | Neutral | Agree | Agree | Agree |
| | If I could live over, I would change nothing | Disagree | Neutral | Disagree | Neutral |
| | So far I have gotten the important things I want in life | Disagree | Agree | Agree | Agree |
| | In most ways my life is close to ideal | Neutral | Strongly Agree | Agree | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | |
| | 1 | Modeling | Model coordination and (Clash Detection | Clash Detection | |
| | 2 | Graphic Creation | Schematic detailing for pBIM Modeling | MEP Coordination | |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Often | Often | Seldom | Often |
| | I get carried away by my work | Regularly | Seldom | Regularly | Seldom |
| | When I am working, I forget everything else around me | Regularly | Regularly | Regularly | Often |
| | I am totally immersed in my work | Regularly | Regularly | Seldom | Often |
| | My work gives me good feeling | Often | Often | Regularly | Always |
| | I do work with a lot of enjoyment | Often | Regularly | Regularly | Always |
| | I feel happy during my work | Often | Often | Seldom | Always |
| | I feel cheerful when I am working | Often | Often | Seldom | Often |
| | I find that I want to work in my free time | Often | Seldom | Never | Often |
| | I work because I enjoy it | Often | Regularly | Seldom | Often |
| | When I am working I do it for myself | Often | Often | Never | Often |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Seldom | Never | Often |
| | I would do this work even if I received less pay | Often | Seldom | Seldom | Always |
| | How often do you feel you have the supplies and resources you need for your work | Often | Regularly | Often | Often |
| | I am motivated from the work itself and not from its rewards | Often | Regularly | Seldom | Regularly |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Regularly | Often | Often |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Often | Regularly | Seldom | Often |
| | I get carried away by my work | Seldom | Regularly | Regularly | Seldom |
| | When I am working, I forget everything else around me | Regularly | Regularly | Regularly | Often |
| | I am totally immersed in my work | Often | Regularly | Seldom | Often |
| | My work gives me good feeling | Regularly | Regularly | Seldom | Always |
| | I do work with a lot of enjoyment | Regularly | Regularly | Seldom | Always |
| | I feel happy during my work | Regularly | Often | Seldom | Always |
| | I feel cheerful when I am working | Often | Regularly | Seldom | Often |
| | I find that I want to work in my free time | Often | Seldom | Never | Often |
| | I work because I enjoy it | Often | Regularly | Regularly | Often |
| | When I am working I do it for myself | Often | Regularly | Seldom | Often |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Regularly | Never | Often |
| | I would do this work even if I received less pay | Often | Regularly | Seldom | Always |
| | How often do you feel you have the supplies and resources you need for your work | Often | Regularly | Often | Often |
| | I am motivated from the work itself and not from its rewards | Often | Regularly | Seldom | Regularly |
| | How often can you talk to your coworkers regarding ideas that you have | Regularly | Often | Often | Often |

| Respondent ID | | 6644037415 | 6642952698 | 6642431852 | 6642098848 |
|---|--|---|---|---|---|
| Gender | Gender | Male | Female | Male | Male |
| No. of years working in the BIM department | | <2 | <2 | 5-8 | 2-5 |
| Size of the VDC/BIM department | | <5 | 5-10 | 5-10 | <5 |
| No. of years you have worked for the company | | <3 | <3 | 3-6 | <3 |
| The number of people you interact with daily | | >10 | 3-6 | 3-6 | 3-6 |
| Please answer the following about yourself | | | | | |
| | I do my best work in a quiet environment. | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Characteristic, agree | Characteristic, agree | Very characteristic or true, strongly agree | Characteristic, agree |
| | In my free time, I would like to be around people. | Uncharacteristic, disagree | Uncharacteristic, disagree | Very characteristic or true, strongly agree | Very characteristic or true, strongly agree |
| Please indicate the following about your life in general | | | | | |
| | I'm satisfied with my life | Strongly Agree | Agree | Strongly Agree | Neutral |
| | My life conditions are excellent | Strongly Agree | Strongly Agree | Strongly Agree | Agree |
| | If I could live over, I would change nothing | Agree | Neutral | Strongly Agree | Neutral |
| | So far I have gotten the important things I want in life | Neutral | Agree | Strongly Agree | Neutral |
| | In most ways my life is close to ideal | Agree | Neutral | Strongly Agree | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | |
| | 1 | Clash detection | BIM Co-ordination | Hvac modelling | Modeling |
| | 2 | BIM Modeling | HVAC Modeling | Plumbing modelling | Clash detection |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Seldom | Often | Always | Regularly |
| | I get carried away by my work | Regularly | Regularly | Always | Regularly |
| | When I am working, I forget everything else around me | Often | Often | Always | Always |
| | I am totally immersed in my work | Often | Often | Always | Always |
| | My work gives me good feeling | Always | Regularly | Always | Always |
| | I do work with a lot of enjoyment | Often | Often | Always | Always |
| | I feel happy during my work | Always | Regularly | Always | Always |
| | I feel cheerful when I am working | Often | Often | Always | Always |
| | I find that I want to work in my free time | Regularly | Often | Always | Often |
| | I work because I enjoy it | Always | Often | Always | Always |
| | When I am working I do it for myself | Often | Often | Always | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Regularly | Always | Always |
| | I would do this work even if I received less pay | Always | Always | Always | Always |
| | How often do you feel you have the supplies and resources you need for your work | Often | Regularly | Always | Often |
| | I am motivated from the work itself and not from its rewards | Regularly | Regularly | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Often | Always | Always |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Seldom | Often | Always | Regularly |
| | I get carried away by my work | Always | Often | Always | Regularly |
| | When I am working, I forget everything else around me | Always | Often | Always | Always |
| | I am totally immersed in my work | Always | Often | Always | Always |
| | My work gives me good feeling | Often | Often | Always | Always |
| | I do work with a lot of enjoyment | Often | Often | Always | Always |
| | I feel happy during my work | Always | Often | Always | Always |
| | I feel cheerful when I am working | Regularly | Often | Always | Always |
| | I find that I want to work in my free time | Seldom | Often | Always | Often |
| | I work because I enjoy it | Regularly | Often | Always | Always |
| | When I am working I do it for myself | Often | Often | Always | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Always | Often | Always | Always |
| | I would do this work even if I received less pay | Always | Often | Always | Always |
| | How often do you feel you have the supplies and resources you need for your work | Often | Often | Always | Often |
| | I am motivated from the work itself and not from its rewards | Regularly | Often | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Often | Always | Always |

| Respondent ID | | 6642085755 | 6642085175 | 6642082911 | 6642082333 |
|---|--|---|----------------------------|---|-----------------------|
| Gender | Gender | Male | Male | Male | Male |
| No. of years working in the BIM department | | 2-5 | <2 | <2 | 2-5 |
| Size of the VDC/BIM department | | 10-15 | 10-15 | >20 | >20 |
| No. of years you have worked for the company | | <3 | <3 | <3 | 3-6 |
| The number of people you interact with daily | | >10 | 6 - 10 | >10 | >10 |
| Please answer the following about yourself | | | | | |
| | I do my best work in a quiet environment. | Very characteristic or true, strongly agree | Characteristic, agree | Very characteristic or true, strongly agree | Characteristic, agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Characteristic, agree | Uncharacteristic, disagree | Very characteristic or true, strongly agree | Characteristic, agree |
| | In my free time, I would like to be around people. | Characteristic, agree | Characteristic, agree | Very characteristic or true, strongly agree | Characteristic, agree |
| Please indicate the following about your life in general | | | | | |
| | I'm satisfied with my life | Neutral | Strongly Agree | Strongly Agree | Agree |
| | My life conditions are excellent | Neutral | Strongly Agree | Strongly Agree | Agree |
| | If I could live over, I would change nothing | Neutral | Strongly Agree | Disagree | Agree |
| | So far I have gotten the important things I want in life | Neutral | Strongly Agree | Disagree | Agree |
| | In most ways my life is close to ideal | Neutral | Strongly Agree | Disagree | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | |
| | 1 | BIM modelling, Family cre | BIM Modelling | Bim modeling | Bim modeling |
| | 2 | Documentation 4D modelli | Clash detection | Clash detection, estimator | Clash detection |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Regularly | Never | Always | Never |
| | I get carried away by my work | Often | Never | Always | Regularly |
| | When I am working, I forget everything else around me | Often | Never | Often | Always |
| | I am totally immersed in my work | Regularly | Never | Always | Always |
| | My work gives me good feeling | Always | Always | Always | Always |
| | I do work with a lot of enjoyment | Regularly | Always | Always | Always |
| | I feel happy during my work | Often | Always | Always | Always |
| | I feel cheerful when I am working | Regularly | Always | Always | Always |
| | I find that I want to work in my free time | Seldom | Often | Never | Never |
| | I work because I enjoy it | Regularly | Always | Always | Never |
| | When I am working I do it for myself | Always | Always | Always | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Often | Often | Always |
| | I would do this work even if I received less pay | Regularly | Often | Often | Always |
| | How often do you feel you have the supplies and resources you need for your work | Regularly | Always | Always | Always |
| | I am motivated from the work itself and not from its rewards | Regularly | Always | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Seldom | Always | Always | Always |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Regularly | Never | Always | Never |
| | I get carried away by my work | Regularly | Never | Always | Regularly |
| | When I am working, I forget everything else around me | Regularly | Never | Always | Always |
| | I am totally immersed in my work | Often | Never | Always | Always |
| | My work gives me good feeling | Regularly | Always | Always | Always |
| | I do work with a lot of enjoyment | Regularly | Always | Always | Always |
| | I feel happy during my work | Often | Always | Always | Always |
| | I feel cheerful when I am working | Regularly | Always | Always | Always |
| | I find that I want to work in my free time | Seldom | Often | Never | Never |
| | I work because I enjoy it | Regularly | Always | Always | Never |
| | When I am working I do it for myself | Always | Always | Always | Always |
| | How often do your supervisors provide clear goals and feedback on your work | Regularly | Often | Often | Always |
| | I would do this work even if I received less pay | Regularly | Often | Often | Always |
| | How often do you feel you have the supplies and resources you need for your work | Regularly | Always | Often | Always |
| | I am motivated from the work itself and not from its rewards | Regularly | Always | Always | Always |
| | How often can you talk to your coworkers regarding ideas that you have | Seldom | Always | Always | Always |

| Respondent ID | | 6640859681 | 6633850198 | 6633704365 | 6625381820 |
|---|--|-----------------------|---|-----------------------|--|
| Gender | Gender | Male | Male | Male | Female |
| No. of years working in the BIM department | | 2-5 | 2-5 | 5-8 | <2 |
| Size of the VDC/BIM department | | 5-10 | >20 | 15-20 | 10-15 |
| No. of years you have worked for the company | | <3 | <3 | 3-6 | <3 |
| The number of people you interact with daily | | 3 - 6 | > 10 | 3 - 6 | 3 - 6 |
| Please answer the following about yourself | | | | | |
| | I do my best work in a quiet environment. | Characteristic, agree | Very characteristic or true, strongly agree | Characteristic, agree | Very characteristic or true, strongly agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Characteristic, agree | Characteristic, agree | Characteristic, agree | Very uncharacteristic or untrue, strongly disagree |
| | In my free time, I would like to be around people. | Characteristic, agree | Characteristic, agree | Characteristic, agree | Characteristic, agree |
| Please indicate the following about your life in general | | | | | |
| | I'm satisfied with my life | Agree | Agree | Agree | Strongly Agree |
| | My life conditions are excellent | Agree | Agree | Agree | Strongly Agree |
| | If I could live over, I would change nothing | Disagree | Disagree | Disagree | Disagree |
| | So far I have gotten the important things I want in life | Neutral | Agree | Disagree | Strongly Agree |
| | In most ways my life is close to ideal | Agree | Agree | Agree | Strongly Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | |
| | | 1 | Modeling for digital fabrication | Clash Detection | Revit modeling |
| | | 2 | Proposal graphics | Coordination | BIM training |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Seldom | Often | Seldom | Seldom |
| | I get carried away by my work | Often | Often | Regularly | Often |
| | When I am working, I forget everything else around me | Often | Regularly | Regularly | Regularly |
| | I am totally immersed in my work | Often | Regularly | Often | Regularly |
| | My work gives me good feeling | Often | Always | Regularly | Regularly |
| | I do work with a lot of enjoyment | Often | Always | Regularly | Regularly |
| | I feel happy during my work | Often | Always | Regularly | Often |
| | I feel cheerful when I am working | Often | Always | Often | Often |
| | I find that I want to work in my free time | Regularly | Always | Seldom | Seldom |
| | I work because I enjoy it | Always | Always | Regularly | Often |
| | When I am working I do it for myself | Regularly | Often | Seldom | Regularly |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Always | Seldom | Regularly |
| | I would do this work even if I received less pay | Often | Often | Often | Often |
| | How often do you feel you have the supplies and resources you need for your work | Regularly | Often | Regularly | Often |
| | I am motivated from the work itself and not from its rewards | Often | Always | Regularly | Seldom |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Often | Regularly | Often |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Seldom | Regularly | Seldom | Seldom |
| | I get carried away by my work | Often | Always | Seldom | Seldom |
| | When I am working, I forget everything else around me | Regularly | Always | Seldom | Regularly |
| | I am totally immersed in my work | Regularly | Always | Seldom | Regularly |
| | My work gives me good feeling | Often | Always | Regularly | Regularly |
| | I do work with a lot of enjoyment | Regularly | Regularly | Regularly | Regularly |
| | I feel happy during my work | Regularly | Regularly | Regularly | Often |
| | I feel cheerful when I am working | Regularly | Regularly | Regularly | Often |
| | I find that I want to work in my free time | Seldom | Often | Regularly | Seldom |
| | I work because I enjoy it | Regularly | Always | Regularly | Regularly |
| | When I am working I do it for myself | Regularly | Always | Seldom | Seldom |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Always | Seldom | Regularly |
| | I would do this work even if I received less pay | Often | Always | Often | Often |
| | How often do you feel you have the supplies and resources you need for your work | Often | Always | Regularly | Often |
| | I am motivated from the work itself and not from its rewards | Regularly | Always | Regularly | Seldom |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Always | Regularly | Often |

| Respondent ID | | 6625376041 | 6625362930 | 6622315795 | 6622113241 |
|---|--|---|----------------------------|----------------------------|---------------------------|
| Gender | Gender | Male | Male | Male | Male |
| No. of years working in the BIM department | | <2 | <2 | 2-5 | >10 |
| Size of the VDC/BIM department | | 10-15 | 10-15 | 5-10 | 5-10 |
| No. of years you have worked for the company | | <3 | <3 | 6-10 | >10 |
| The number of people you interact with daily | | 3 - 6 | 6 - 10 | 6 - 10 | > 10 |
| Please answer the following about yourself | | | | | |
| | I do my best work in a quiet environment. | Very characteristic or true, strongly agree | Characteristic, agree | Characteristic, agree | Characteristic, agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Characteristic, agree | Uncharacteristic, disagree | Uncharacteristic, disagree | Characteristic, agree |
| | In my free time, I would like to be around people. | Characteristic, agree | Characteristic, agree | Characteristic, agree | Characteristic, agree |
| Please indicate the following about your life in general | | | | | |
| | I'm satisfied with my life | Agree | Strongly Agree | Strongly Agree | Agree |
| | My life conditions are excellent | Neutral | Strongly Agree | Strongly Agree | Agree |
| | If I could live over, I would change nothing | Agree | Neutral | Disagree | Neutral |
| | So far I have gotten the important things I want in life | Disagree | Agree | Agree | Agree |
| | In most ways my life is close to ideal | Agree | Neutral | Agree | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | | |
| | 1 | Model based estimation | BIM modeling | BIM Management | Managing model building 1 |
| | 2 | proposal graphics | Model based estimation | BIM modeling | Exploring new workflows |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Seldom | Regularly | Seldom | Often |
| | I get carried away by my work | Often | Regularly | Often | Often |
| | When I am working, I forget everything else around me | Often | Seldom | Seldom | Often |
| | I am totally immersed in my work | Often | Regularly | Regularly | Often |
| | My work gives me good feeling | Often | Always | Often | Often |
| | I do work with a lot of enjoyment | Often | Always | Always | Often |
| | I feel happy during my work | Regularly | Always | Often | Regularly |
| | I feel cheerful when I am working | Often | Often | Often | Regularly |
| | I find that I want to work in my free time | Regularly | Seldom | Often | Often |
| | I work because I enjoy it | Regularly | Often | Regularly | Often |
| | When I am working I do it for myself | Often | Regularly | Often | Regularly |
| | How often do your supervisors provide clear goals and feedback on your work | Often | Often | Regularly | Regularly |
| | I would do this work even if I received less pay | Regularly | Regularly | Often | Often |
| | How often do you feel you have the supplies and resources you need for your work | Often | Regularly | Often | Regularly |
| | I am motivated from the work itself and not from its rewards | Regularly | Always | Regularly | Often |
| | How often can you talk to your coworkers regarding ideas that you have | Regularly | Always | Often | Often |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | | |
| | When I am working, I think about nothing else | Regularly | Regularly | Seldom | Often |
| | I get carried away by my work | Seldom | Regularly | Regularly | Often |
| | When I am working, I forget everything else around me | Often | Seldom | Seldom | Often |
| | I am totally immersed in my work | Seldom | Regularly | Regularly | Often |
| | My work gives me good feeling | Often | Always | Often | Often |
| | I do work with a lot of enjoyment | Often | Always | Often | Often |
| | I feel happy during my work | Often | Always | Often | Regularly |
| | I feel cheerful when I am working | Often | Often | Often | Regularly |
| | I find that I want to work in my free time | Often | Never | Often | Often |
| | I work because I enjoy it | Seldom | Always | Regularly | Often |
| | When I am working I do it for myself | Often | Regularly | Often | Regularly |
| | How often do your supervisors provide clear goals and feedback on your work | Regularly | Often | Regularly | Regularly |
| | I would do this work even if I received less pay | Often | Regularly | Often | Often |
| | How often do you feel you have the supplies and resources you need for your work | Often | Often | Often | Regularly |
| | I am motivated from the work itself and not from its rewards | Often | Always | Often | Often |
| | How often can you talk to your coworkers regarding ideas that you have | Regularly | Always | Often | Often |

| Respondent ID | | 6619722365 | 6617855957 | 6617792848 |
|---|--|----------------------------|---|----------------------------|
| Gender | Gender | Male | Male | Male |
| No. of years working in the BIM department | | 2-5 | <2 | >10 |
| Size of the VDC/BIM department | | >20 | 5-10 | 5-10 |
| No. of years you have worked for the company | | 3-6 | < 3 | >10 |
| The number of people you interact with daily | | 3 - 6 | > 10 | > 10 |
| Please answer the following about yourself | | | | |
| | I do my best work in a quiet environment. | Uncharacteristic, disagree | Characteristic, agree | Characteristic, agree |
| | In large social gatherings, I often feel a need to seek out space to be by myself. | Uncharacteristic, disagree | Very characteristic or true, strongly agree | Uncharacteristic, disagree |
| | In my free time, I would like to be around people. | Characteristic, agree | Characteristic, agree | Uncharacteristic, disagree |
| Please indicate the following about your life in general | | | | |
| | I'm satisfied with my life | Strongly Agree | Agree | Agree |
| | My life conditions are excellent | Agree | Neutral | Strongly Agree |
| | If I could live over, I would change nothing | Agree | Disagree | Disagree |
| | So far I have gotten the important things I want in life | Agree | Neutral | Neutral |
| | In most ways my life is close to ideal | Agree | Disagree | Agree |
| Please write the two activities in the BIM department that you perform the most. (Eg: BIM Modeling, Model based estimation, clash detection, proposal graphics, 4-D Modeling etc.) | | | | |
| | 1 | Programming | BIM Modeling | Quantity takeoff |
| | 2 | VR Simulations | Clash detection | Generation of imagery |
| Think about the time when you performed the activity ranked 1 from the above question and please answer the following questions. | | | | |
| | When I am working, I think about nothing else | Regularly | Regularly | Regularly |
| | I get carried away by my work | Often | Seldom | Regularly |
| | When I am working, I forget everything else around me | Often | Seldom | Seldom |
| | I am totally immersed in my work | Often | Regularly | Regularly |
| | My work gives me good feeling | Often | Often | Regularly |
| | I do work with a lot of enjoyment | Often | Regularly | Regularly |
| | I feel happy during my work | Often | Regularly | Regularly |
| | I feel cheerful when I am working | Often | Often | Regularly |
| | I find that I want to work in my free time | Always | Seldom | Seldom |
| | I work because I enjoy it | Always | Often | Seldom |
| | When I am working I do it for myself | Often | Always | Seldom |
| | How often do your supervisors provide clear goals and feedback on your work | Never | Never | Regularly |
| | I would do this work even if I received less pay | Often | Seldom | Often |
| | How often do you feel you have the supplies and resources you need for your work | Often | Often | Often |
| | I am motivated from the work itself and not from its rewards | Often | Seldom | Regularly |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Seldom | Regularly |
| Think about the time when you performed the activity ranked 2 please answer the following questions. | | | | |
| | When I am working, I think about nothing else | Seldom | Seldom | Regularly |
| | I get carried away by my work | Often | Seldom | Regularly |
| | When I am working, I forget everything else around me | Often | Never | Seldom |
| | I am totally immersed in my work | Often | Seldom | Regularly |
| | My work gives me good feeling | Often | Regularly | Regularly |
| | I do work with a lot of enjoyment | Often | Often | Regularly |
| | I feel happy during my work | Often | Regularly | Regularly |
| | I feel cheerful when I am working | Often | Regularly | Regularly |
| | I find that I want to work in my free time | Regularly | Seldom | Seldom |
| | I work because I enjoy it | Regularly | Regularly | Seldom |
| | When I am working I do it for myself | Regularly | Always | Seldom |
| | How often do your supervisors provide clear goals and feedback on your work | Seldom | Never | Regularly |
| | I would do this work even if I received less pay | Often | Seldom | Often |
| | How often do you feel you have the supplies and resources you need for your work | Often | Seldom | Often |
| | I am motivated from the work itself and not from its rewards | Regularly | Seldom | Regularly |
| | How often can you talk to your coworkers regarding ideas that you have | Often | Seldom | Regularly |

