Mapping Emotional Intelligence in Product Development Teams

by

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Abstract

There is no doubt that performance and output of a product development teams can be attributed to creativity, knowledge and leadership. To increase the chances for a successful project outcome, open communications, trust, and judgment should be shared between PMs and their stakeholders (Skulmoski & Hartman, 2010). However, there are several claims about the positive effect of emotional intelligence (EI) on work team performance, both in commercial and scientific literature. Emotional intelligence (EI) plays a role in effecting that trust. Goleman, Boyatzis, and McKee (2002, p. 59) suggest that by cultivating trust EI can help one maximize "cooperation, collaboration, and effectiveness."

This thesis focuses on Integrated Design and Management program, where engineers, designers and business professionals come together to form teams and develop innovative products. These teams start with same project brief and with a similar goal in mind.

In this study, I am assessing emotional intelligence using the mood meter from the RULER course by Yale Center for Emotional Intelligence. Other parameters are collected through

observation, surveys and interviews at different stages of the project with individuals enrolled in the IDM program at MIT. This thesis will be mapping individuals' emotional intelligence with their disciplines, roles in the project and at different phases of the project. Teams can lead to positive inferences relating to multidisciplinary teams and competitive work cultures. I believe that studying the correlation between the different parameters can lead to useful inferences relating to team performance and work satisfaction of individuals.

Acknowledgments

I would first like to thank my advisor Matthew Kressy, Director of Integrated Design and Management at Massachusetts Institute of Technology. His mentorship and support has helped me achieve high goals and success in the thesis as well as life. He consistently allowed this project to be my work and steered me in the right direction with his extraordinary wealth of guidance, knowledge, encouragement and passion.

I would like to thank the 2017 Integrated Design and Management cohort for cooperating with my study and taking the time out to talk about their experiences.

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Chapter 1

Introduction

1.1 Introduction to the Problem

This thesis is for the people who aspire to build successful products with multidisciplinary product development teams working together in cohesion. By this I mean the individuals are passionate about their work and they are driven by innovation to move their company forward. According to a study by Forbes in Oct 2013 only a 13% of the population feel engaged by their jobs. A total of twenty-five million employees in 189 different countries were a part of the survey. A majority of 63% population were not engaged in the jobs that they were doing, which meant they were putting in very little energy. The rest of 24% were actively disengaged, which means they hated their jobs. The last two categories added up being 87% are also tagged as the most emotionally disconnected employees and it is less likely that their work would have been productive. This also means that work for them was more of a source of frustration than a source of fulfillment and motivation. This also leads to less productive workplaces. With all the study going on in the field of employee satisfaction and productivity at the workplace, emotional intelligence plays a vital role.

In this study, I am focusing on the appraisal of one's own emotions and understating the factors influencing the individuals. I am also analyzing any patterns or anomalies in emotions based on individual's disciplines in a team.

1.2 Background of the Study

Emotional Intelligence is a concept, first proposed by Mayer & Salovey (1990) which was then popularized by Goleman: Why it can matter more than IQ. Thorndike, 1920 classified intelligence into three broad categories. The first involved the abstract, analytics and verbal intelligences, the second involved the mechanical, performance, visual-spatial and synthetic intelligence and the third consisted of social and practical intelligence, which was termed as emotional intelligence by Mayer and Salovey. Since then emotional intelligence has got much attention in the field of human resource management, organizational behavior and leadership. There are four dimensions of emotional intelligence, appraisal and expression of emotion (own and others), use of emotions and emotional management (own and others) (Wong & Law, 2002). There are several reports which show that employees with higher EQ (emotional intelligence) generate more productivity, more value to the companies and increased ROI's. EQ plays a vital role in the making of successful project managers. According to recent studies it is believed that a project managers' emotional intelligence is correlated with their professional success (Obradovic et al. 2013). Which makes it important to understand the factors affecting emotions in individuals working in a team. The focus of this study is to understand the correlation between individuals' emotion, disciplines, phases of the project, team dynamics and the project itself.

1.3 Product Development Team

There are three fundamental elements for setting up a product development successfully: Environment (facilitator), Team (creators of product) and the mentor (enabler). Environment and mentor are constant variables in this study and is provided equally to all teams. They play an important role in the teams' throughput. The Integrated Design Lab work space and the program directors', Matthew Kressy, mentorship are the product of observed decisions based on expertise and experienced design thinking processes for product development. The teams also have Andrew MacInnis as workshop mentors which help them with prototyping and manufacturing difficulties. Environment is a subjective experience for team individuals. The Integrated Design Lab work space is designed in a way that it fosters creativity and supports design thinking for teams. It is equipped with a machine space which helps teams to think freely about designing and prototyping a product. There would be other variables in a project development team, which would reveal while the study. For this study, we have considered IDM project development teams which have multidisciplinary team members.

1.4 Focus on IDM

Integrated Design and Management (IDM) program at MIT is centered around creating product development teams that produces exceptional leaders in product and service development. The program was born with the idea that product development teams must collaborate across multi-disciplinary expertise to add desirable, feasible and viable value to the products. IDM integrates three disciplines (Engineering, Design and Business) to form collaborative teams and is mentored by constructive design thinking process. While addressing the standard MIT

pedigree requirements the program director, Matt Kressy, also assess each students' capacity for expressing and manifesting compassion in work and relationships. Along with the standard MIT pedigree, the compassion of a socially responsible white-collar professional, and the relevant industry represented at the product table, IDM is set up to produce agile, integrated teams that will lead the next generation of consumerism and service industries. It is a common belief, that good teams are built by individuals with a well-rounded profile. In reality, compassionate people are the building blocks of the best multidisciplinary teams. Compassion here encompasses emotional intelligence empathy, altruistic commitment towards work and people and social intelligence. This additional credential of social and self-awareness is believed to manifest quality relationship building, active listening and fluency in anthropological signals or subliminal epistemological reasoning. Compassion, a strong element of emotional intelligence and social intelligence has been an integral metric for recruiting IDM students. The director strongly believes that the when a person loves, they learn to appreciate and they see the good in everything. These good things reflect in their work thus increasing the quality of the work. The IDM student describes the manifestation of compassion in one of his statements that: the cohort is very cooperative and supportive with each other without any external intervention, they truly feel like a family. "All of us come from different industries, experiences and places but there is a strong bond of compassion among everyone." Using the RULER frame-work the study will analyze the emotional intelligence of product development teams in Integrated design and Management program at MIT. Starting in the first fall academic semester of the programs curriculum, Integrated Design Lab I, the cohort forms teams to work on semester long product development. Every team has the same project brief of developing kitchen related products. The teams are multidisciplinary in nature, mostly

including individuals with engineering, business and design background. These teams come together and decide on different kitchen related themes they like to work on. The project is divided into six distinct phases which are, team formation, design research, concept generation, prototyping, manufacturing and sales. For this study to capture more granular data I have divided these phases into sub-phases which mark the start and end of each phase.

1.5 Research Hypothesis

Hypothesis for this study are: there would be some correlation in the emotions of distinct disciplines and the phases of the project. Teams with higher enabling emotions are happier throughout the project. There would be some correlation with the teams goal assessment and the teams emotional intelligence measured. There would not be many confounding variables affecting the teams as this project takes up most of the time of the individuals.

1.6 Assumptions and Limitation of the Study

This thesis is an exploratory research of emotional intelligence and behavior of master's students within MIT's IDM program. Students were periodically required to answer survey questionnaires which was used to analyze their behavior and draw conclusions. These conclusions may not be generalized and extrapolated to all cross-function teams.

As the teams are recruited with individuals who are high in the compassion metric, an integral assumption of the study is that these individuals are high in self-awareness and can clearly identify their emotions at any point of time. There might be many other factors effecting the teams' emotional health which would not be measured in this study. This study is for a unique

product development team which comprises of individuals with distinct disciplines: design, engineer and business. It is assumed that each team practices the different phases of the project as directed and advised by the Integrated Design and Management program. These phases are: team formation, design research, concept generation, prototyping, manufacturing and sales.

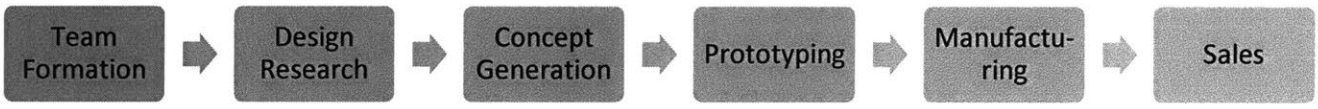

Figure A.1: Phases of project

Each team is mentored by the director of the program, Matthew Kressy for design thinking principles for product development and Andrew MacInnis for any help related to prototyping and manufacturing using machinery and materials. It is assumed that their mentorship helps these teams make viable decisions at certain phases of the project. There is no bias in the mentorship provided to the teams or individuals in the program throughout the project. Every team is responsible for making decisions for their product and materials they would use. All confounding variables in the study are not accounted for in the research because it is not possible to quantify. These could be external stress causing agents like course exams for other courses, any family related issues or travelling problems. The team individuals have distinct discipline experiences and it reflects in the product development project which they are working in. A major assumption is that all the individuals understand the mood meter and give their relative responses based on that. The colors add a significant feature to the meter which helps them understand the emphasis on words on the mood meter.

Name: _____

Figure A.2: Mood meter

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Chapter 2

Documentation of Research

This study is about understanding the emotions of the individuals on the product development teams in different phases of the project. For this thesis, the product development was divided into twelve distinct phases based on the design process that Integrated Design and Management follows. The data collection can be divided into three steps: 1- collecting team goals in the beginning of the project and their assigned roles within the teams, 2- collecting emotions of individuals in twelve phases of the project, 3- observing confounding factors affecting the team, 4- collecting responses from individuals of the factors they think are responsible for their emotions.

23-Oct	**25-Oct**	**30-Oct**	**1-Nov**
1 - Team formation		**2 - Design research**	
What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?

6-Nov	8-Nov	13-Nov	15-Nov
3 - Concept generation		**4 - Prototyping**	
How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?

20-Nov	22-Nov	27-Nov	14-Dec
5 - Manufacturing		**6 - Sales**	
What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre-order experience?	How do you feel after the final sale?

Table B.1: Questions for phases of project

There are factors like team dynamics and teams working ability which contribute to the teams' creativity, motivation levels and management. There is no mentorship to help teams with these confounding factors.

The Integrated Design and Management cohort is admitted based on MIT standards of individual intelligence, and will not reanalyze the individuals' academic performance. The cohort has been screened for the compassions metric by director Matthew Kressy in the application process which implies that all the individuals are high in emotional intelligence.

The cohort is diverse and in academic and professional backgrounds, ethnicity and gender. The cohort goes through a rigorous orientation program before the semester starts which has plenty of team building opportunities and provides time to bond with the cohort by knowing each other better. This project spans for seven and half weeks in the first fall semester of the program. They are trained in practicing design-thinking process for developing desirable, feasible and viable products. Students are sorted into teams so that they are evenly multidisciplinary between engineering, business and design disciplines. The study examines all seven teams of three students each working on the same project brief. The brief for the project is to develop products for the future of the kitchens. The project will include the manufacturing of 50 units that will be sold to the greater MIT community. The project will enable the practice of opportunity identification, design research, concept generation and selection, detail design, manufacturing, branding, marketing, and sales. The first 2 weeks will be devoted to market and design research. The next 3½ weeks will be devoted to concept generation and detail design, and the final 2½ weeks to manufacturing and sales.

2.1 Data Collection Process for the Study

To understand the teams' goal better and give them a head start, the project sent out a goal assessment sheet once the teams are sorted. The assessment lets the team discuss and pave the next steps for the project. The assessment helps them bring some structure in the management of the project.

S. No.	Question
1.	How will you manage your project plan? How often will you meet as a team?
2.	Who will be the team lead to keep everyone on track and move decisions along?

3.	What are the roles within your team (biz, eng, design)?
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it?
5.	How do you manage stress?
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it?
7.	What do you define as success for your team with this project?
8.	What are your personal goals with this project?
9.	What type of technical support and training will your team need the most help with to make this a successful project?

Table B.2: Goal assessment questions

Questions like who would be leading the team and how will they hold one another accountable when a team member falls behind on responsibilities is expected to help them from any possible frictions in the team. The teams' goals will be discussed in the next chapter to understand how that effects the individuals. After this assessment, I talked to everyone about their experience in working with their team members and how their experience was. I had twelve meetings with the team members to understand their emotions at the different phases of the project. Over all these meetings most of them became comfortable talking to me and shared their experiences working with their team members. All the meetings with the teams were confidential and they knew that their names would remain unknown in the study, which made them comfortable opening up to me. In these meetings I observed and collected various confounding factors which were major influencing factors for the teams. The twelve phases of

the project are divided based on the design process that Integrated Design and Management program follows. The six main phases are team formation, design research, concept generation, prototyping, manufacturing and sales. All these phases are further divided into the starting and the end of the phase which makes it twelve phases in the project. At the end of the project, I also collected responses about the factors which were responsible for their emotions throughout the project.

The cohort had access to the ID-Lab which was equipped with machinery workshop and was available to all the teams. The teams were trained to use all the machines before the project started and they had to book some of the machines in advance based on availability. There was basic material provided to the students which helped them in prototyping their ideas. The space also has a kitchen space which stocks tea, coffee and water, also has a common fridge, microwave and disposable cups and utensils. There are a range of meeting spaces for the teams within the ID-Lab and many more in the building. Teams can choose any place for meetings and discussions. Other common tools are TV, projector, printers, rolling whiteboards and Wifi. The teams can further increase their scope of tools by connecting with other labs or people, but that is up to the team.

Another important confounding variable is the mentorship and guidance of IDM director Matthew Kressy and workshop mentorship from Andrew MacInnis. Teams have meeting with Matt Kressy on twice a week from 2 - 5pm to discuss progress and guide them. Andrew MacInnis is available from 11 - 6pm twice a week. They are available in office on campus on other days also and can be approached by call or mail anytime a student needs them. Matt guides the teams by asking open questions unless the teams ask for anything. The teams also seek help from Matt with psychological and social issues if needed.

2.2 Details of the Project

The project is to manufacture a minimum of 50 products for the future of kitchen. The success of the project is defined by the selling of the manufactured products. The minimum criterion is to develop, manufacture, and sell all 50 units at the Sales Gala. Sales Gala happens on the last day of the semester in the E-62 café in Sloan School of management. They are allowed to sell up to 25 products in pre-sales before the sales gala. A lot of teams manufacture more than 50 products and sell more in both pre-sales and sales gala, this decision is based on teams individuals. IDM doesn't fund the projects to give a real feel of starting a business and trying to make profit. The profit that the team makes goes to the team and IDM does not have any stake in the profits. Over the semester the teams also have classes for pricing, marketing, market research which helps in placing the product in the market and sell it appropriately. The teams can use any kind of resources for marketing, manufacturing and pre-sales as long as they adhere by the brief of the project. The teams can start their own company based on the products and IDM would not hold any restrictions for the products. These products can be patented by the students in their name.

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Chapter 3

Discussion of Results

3.1 Goal Assessment of Teams

A goal-assessment questionnaire shown in (Table A.1) was sent out to the teams to fill in before the project started. This was after the teams were formed and they were expected to have a strategy to go ahead with the project. This assessment is intended to increase the understanding among the team members. The assessment helps the team to think of a project plan and decide the roles of the team members within the team, which paves a systematic path for the project. The goal assessment questions can be referred from (Table B.2).

The assessment sheets were completed within a weeks' time. Below are the assessment sheets from all the teams. For confidentiality purposes, the names of the team members have been changed.

Some key questions were about the roles that the team members would be taking up throughout the project.

Team 1

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - Google drive for presentations and WhatsApp for communication - Meet 4 times a week in addition to the class timings
2.	Who will be the team lead to keep everyone on track and move decisions along? - T13 will be the acting team leader to keep a track of the project.
3.	What are the roles within your team (biz, eng, design)? - T11 - Business and sales - T12 - Design and engineering - T13 – Package design and project management
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - We will sit and discuss issues related to project design and delays - We would sit and discuss as a team in case any of the team members doesn't work in an expected way.
5.	How do you manage stress? - T11 – Need to discuss things out - T12 – Likes to watch movies when stressed - T13 – Need time by herself
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it?

	- T11 – is very insensitive while giving feedback. Approach: Talk to them - T12 – stresses out when team members don't get along. Approach: talk - T13 – Don't like it when people don't work. Approach: explain why it is important
7.	What do you define as success for your team with this project? - Planning to sell more than 50 products in Sales Gala
8.	What are your personal goals with this project? - T11 – Work with designers and learn product development processes - T12 – Know more about the business aspect of product development - T13 – Manage multidisciplinary team to develop product
9.	What type of technical support and training will your team need the most help with to make this a successful project? - Material knowledge and machinery skills

Team 2

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - Software: Google Drive for slides/presentation/documents. Meet 3-4 times/week: during studio (2x); additional meeting times - Doodle
2.	Who will be the team lead to keep everyone on track and move decisions along? - T22 – Team Lead, Time Line Manager
3.	What are the roles within your team (biz, eng, design)?

	- T22 - Inspiration Manager - T24 - Tools & Business Operations Manager - T23 - Materials & Forms Manager - T21 - Packaging Design & Customer Experience Manager
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - Follow-ups important. - Conflict Management - first priority is talk in person or phone. Text message last. Feedback must be constructive. If feedback too harsh, ask why.
5.	How do you manage stress? - T23 – Needs alone time when stressed, must smoke. Buy T23 a drink. Sign: hand fidgeting - T21 – Time out to breath outside, cook. Give T21 food. Sign: disorganized - T24 – Sleep, do it next day. Talk to T24. Sign: overeating junk food - T22 - Likes to talk to people/dances. Talk to T22. Sign: detached, slight anger, too direct
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T23 – Not paying attention, doesn't put effort in project. Approach: talk to person. - T21 – No effort to add input in project. Approach: prod person for ideas.

	- T24 – When people rush, respect the learning process. Approach: talk to them. - T22 - When we don't value each other's thinking process. Approach: talk to them.
7.	What do you define as success for your team with this project? - Proud to be there at the sales gala, see people really want the product and find it worth their money, sell 100 units.
8.	What are your personal goals with this project? - T23 – How to work with other people in a design project (for future), and get feedback from the team. - T21 – Design process and any engineering skills - T24 – Business and design process - T22 - Manage a team of peers, balancing relationships and goals
9.	What type of technical support and training will your team need the most help with to make this a successful project? - materials & machinery training for steel, etc.

Team 3

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - Excel for deadlines and tasks / Whatsapp for day to day communication

	- Will meet during the free time between Monday and Wednesday IDM sessions - Extra meetings, if necessary, will be scheduled during that time
2.	Who will be the team lead to keep everyone on track and move decisions along? - T32
3.	What are the roles within your team (biz, eng, design)? - Business – T31 - Design – T33 - Engineer - T32
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - Divide up tasks, if someone has fallen behind or might be behind, it's his/her responsibility to notify the other teammates - Other teammates will step up, redistribute the work later - We will take corporate ownership of ideas and problems
5.	How do you manage stress? - T33: Play music - T32: Meditate, swim - T31: Verbal processing
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T33: Wasting time – talking around in circles, repetition - Solution: making agendas, distributing the work

	- T32: People being late for meetings, problems festering - Solution: Stating problems out loud, open communication - T31: People that don't do any work - Solution: Open communication
7.	What do you define as success for your team with this project? - Time and resource efficiency - Making a profit - Make a product that we're proud of
8.	What are your personal goals with this project? - T33: Improve on design skills. Better manage time - T32: Learn how to sell a product. Improvement of presentation skills. Honing design and business skills. - T31: Making something physical. Being able to CNC/laser cutting
9.	What type of technical support and training will your team need the most help with to make this a successful project? - Most efficient way of creating something - We need to understand how to manufacture our different options (Andy!)

Team 4

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - Excel sheet for documents - Meetings for communication through phone, messages and in person
2.	Who will be the team lead to keep everyone on track and move decisions along? - T41
3.	What are the roles within your team (biz, eng, design)? - Business – T41 - Design – T42 - Engineer – T43
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - We will discuss in team meetings if a team member doesn't perform tasks as expected
5.	How do you manage stress? - T41: Dance - T42: Watch movies - T43: Go on long walks
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T43 – arbitrary meaningless rules and wants brutal honesty. – ask why

	- T42 – Being on time - T41 – Be straight forward. Asks questions to align. Don't say yes/nod and then realizes weeks later nothing is done and aligned
7.	What do you define as success for your team with this project? - Make something which we are proud of - Efficient, special and be smart about production - Sell more than 50, within 100. Make profit
8.	What are your personal goals with this project? - T42 – Something nice for portfolio - T43 – Make best product in class - T41 – Portfolio (set up), Cost, beautiful product, enable fun and enjoyable experience
9.	What type of technical support and training will your team need the most help with to make this a successful project? - Machinery and resourcing

Team 5

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - Google sheets - Meet during class. Regularly scheduled spot that we can use as needed (T53 sends out doodle).

2.	Who will be the team lead to keep everyone on track and move decisions along? - T51
3.	What are the roles within your team (biz, eng, design)? - T51: business - T52: designer - T53: engineer
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - 3 days at least in advance notice. - Communication is key. Not just everyone going off by themselves to figure things out on their own. Not just one person is making decisions. Making everyone feel like they're part of the decision making. - Check in with each other to make sure we're all good.
5.	How do you manage stress? - T53: likes to be independent, do activities together with the team. - T52: work out, lists - T51: baking, food
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T53: when someone doesn't say what's on their mind - T52: talking about people behind the back - T51: excluded
7.	What do you define as success for your team with this project?

	- Sales. Make above 50. - Everyone learns something - Excited to sell, not over-selling. Sells itself.
8.	What are your personal goals with this project? - T53: full ecosystem for the product. Packaging, stand, pitch, synchronized. Get to know each other better. - T52: system, world-building. Understand manufacture and pricing time/cost. How much is our time worth? - T51: new skill learning. Hand building.
9.	What type of technical support and training will your team need the most help with to make this a successful project? - Wood working and sourcing - Joinery

Team 6

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - We will manage our project plan through a shared Gantt chart and google calendar. We will communicate primarily through WhatsApp. - We will reserve Tuesdays from 3pm-5pm each week for group work; however, this meeting time may be flexible depending on the demands of the week.

2.	Who will be the team lead to keep everyone on track and move decisions along? - T62 will start out as the team lead. - We may rotate the team lead according to the project phase (i.e. if a team member wants to learn more about manufacturing, they may take over the role during this time).
3.	What are the roles within your team (biz, eng, design)? - Business: T63 - Engineering: T62 - Design: T61
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - We anticipate that the team will need flexibility in our workload from week to week. - Open communication and usage of our planning tools should help mitigate issues. - However, to ensure communication, we will hold a 5 minute "retro" or check-in session during our weekly meeting - If team members are feeling that the workload balance isn't healthy, this should be communicated and can be addressed in the retro of weekly meeting.
5.	How do you manage stress? - T62: Getting exercise, talking with friends, taking time to have a meal, and getting good sleep. Although usually stress won't go away until the

	work is actually done - staying ahead of the work is also a preventative way for me to manage stress. - T63 : Try to prevent stress as much as possible - usually by setting expectations and getting work done. But driving or going for a walk or happy music are the best ways for me. Also if I don't sleep I'm worthless so I try to plan for that. - T61: I like to make work feel more like fun--for me the team's overall happiness is over everything else. Being open and talking about the source of my stress helps. Running, music, going out for dinner are other stress busters for me.
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T62: Not communicating clearly on schedules and an execution plan for finalizing work on time. Other teammates being inconsiderate, not taking a group deadline seriously, and miscommunicating about how we were going to get the work done has bothered me in the past (for example, my teammate skipped out on our work session to go to a party the night before our presentation was due when he hadn't finished his work yet). - T63 : Mostly if a teammate or group is inconsiderate of others on the team, or flat-out rude. Most things I can brush off or let go, though. - T61 : People being too serious/competitive in a team. I am pretty forgiving and understanding—I sometimes hold others to the same

	standard. It is fine for people to fuck up as long as the intention was in the right place.
7.	What do you define as success for your team with this project? - Make 50, sell 50 (Undersell, overdeliver) - Satisfy to top personal goal of each team member - Break even at a minimum - We all learn throughout the process - We have fun throughout the process - Overcome challenges in a graceful way - fun process of growth and not a chore
8.	What are your personal goals with this project? - T62 : Have fun with the group and with the project process. Learn about manufacturing something well (beautifully and robustly) and be confident to sell what we've created. Break even at a minimum. Have our customers be excited to purchase our product and enjoy using it - T63 : Learn from and enjoy the time with others in the group. Integrate design thinking into business principles - how to consider people on the viability side of things. Make some money if we can (whoo hoo!) or break even at the least. Make a product that I want my family to buy, not because I made it, but because it was awesome. Sell all 50 - T61 : Get some hands-on experience on the various manufacturing processes/machines/tools. Get comfortable with some design tools - illustrator, photoshop, fusion 360. Learn Learn Learn from T62 and T63

9.	What type of technical support and training will your team need the most help with to make this a successful project? - Materials selection - Material processing (silicone molding, vacuum forming etc)

Team 7

S.No.	Questions
1.	How will you manage your project plan? How often will you meet as a team? - We will use trello and whatsapp group to communicate. We set goals every Monday, including plans and goals for the twice weekly meetings.
2.	Who will be the team lead to keep everyone on track and move decisions along? - Phase1: Concept Creation -- T72 - Phase 2: Prototype – T71 - Phase 3: Manufacturing -- T73
3.	What are the roles within your team (biz, eng, design)? - T72: Engineering and Business - T71: Engineering and design - T73: Design and Engineering
4.	How will you hold one another accountable? If a team member falls behind on their responsibilities, how will you address it? - We give each other a heads up on our bandwidth every and communicate early often.

5.	How do you manage stress? - T71: Needs to be on her own, bath/ alone time/ solitary time - T72: Anxiety attack. Emotional support helps in times of stress. - T73: Extremely detail oriented in high stress modes. Needs personal time to decompress. Helps to remind her of team and personal goals
6.	What's one of your biggest pet peeves when working in a team and how did you deal with it? - T72: When people are not focused on the speaker and general lack of attentiveness. Lack of communication - T73: Chewing noises, inefficient use of time in just/ insensitive behavior - T71: Complaining, abiding by rules
7.	What do you define as success for your team with this project? - Creating a product that brings people happiness that people want to engage with. Finding the sweet spot between simplicity and innovation and being proud to present that.
8.	What are your personal goals with this project? - T73: Pleasant team experience, make profit be proud of the end product - T72: Experimenting, getting out of her comfort zone, being proud of the end-product - T71: Cash flow positive venture, learning to work with different cultures, innovation and helping introduce more happiness into people's lives
9.	What type of technical support and training will your team need the most help with to make this a successful project?

	- We want to work on more functional products and may need help getting to off the shelf solutions quick and early.

Most of the individuals positioned as a product manager role had different ways of managing the project plan. Three teams out of seven opted for using google drive for the team presentations, which showed their emphasis on collaborative work. Six out of seven teams rely on communication through services like WhatsApp, phone calls and messages. They preferred set meeting times throughout the week and only one team decided to have impromptu meetings whenever needed. Two of the teams decided on using project planning software's like Gantt chart and Trello. This sets expectations for the team members for planning and executing the project.

Teams were asked to opt one of their team members as a team lead who's responsibility would be to keep everyone on track and move the decisions along in the project. There was a striking balance in the disciplines who were elected across all the teams. In six of the teams two engineers, two designers and two business candidates were elected as the team leads. There were different motives for such a decision, most of the candidates wanted to experience their role as a team lead and learn on a safe ground. Teams which were not willing to experience and were competitive assigned team lead roles to people who had their prior experience as team leads. Team T7 took a unique approach of diversifying the individuals' roles as someone who manages concept creation, prototyping and manufacturing. This grouped the project into three major sections and distributed the phase management. Concept creation role was given to the designer, prototyping to the Business expert and manufacturing to the engineering

candidate. The team decided to apply their expertise from their prior work experience in the project.

All the teams consider communication as one of the most important aspects of team building and solving issues in the project. Three of the teams feel that meeting in person is the best way to solve any issues. T3 also believes that feedback is an integral part of teams growth and open communication. T6 believes that all the issues with the team should be discussed in the weekly scheduled meetings and they didn't see the need of having a separate meeting. These different approaches help team members communicate freely and build a good relationship within the team.

The team members also discussed what they do to relieve their stress. This helps the team members to know each other better and help them out when they think or know that they are stressed out. T2 answered this in a unique way by listing out the signs of the team members, so that the team members can identify about each other's stress levels. This helps the team to take specific actions and act early on. These emotions effect the productivity of the project and their feelings associated with the project.

The teams were also asked to discuss their pet peeves. This approach revealed things which bothers the individuals, making sure that other members are considerate about their pet peeves. Four of the teams decided to make more than 50 units and sell all of them for a large profit. Four of the teams defined success by making a product which they are proud of and makes people happy. T6 was focused on making just 50 units of the product and selling them to break even. Their focus was on learning and having fun throughout the project. Teams definition of success effects the emotions of the individuals for each phase as there are various uncertain factors which might alter the output of the project. The projects' brief was to manufacture a

minimum of 50 units and putting them up for sale in the sales Gala. Teams T1, T2, T4 and T5's decision of making more than 50 units puts an added pressure for achieving the goal within the given time.

All the team members set personal goals and expectations for themselves in the project timeline. The personal goals varied from honing technical skills to learning from peers and improving one's team management skills.

The goal assessment facilitated the teams to understand the requirements of the project and the team members better. This urged them to be sensitive to the team members and the self-reflect on emotions.

3.2 Mood Meter Analysis

As stated by Yale Center for Emotional Intelligence, emotions drive learning, decision making, creativity, relationships and health. This study uses the mood meter from RULER studies. The mood meter's x-axis has the energy level and the y-axis as the pleasant to unpleasant feelings meter. This meter has 100 feelings plotted based on the both axis. This meter is used as a survey sheet for plotting the feelings of individuals at all the twelve phases of the project. Refer (Figure A.2).

The colored survey sheet was used to collect the feelings of the individuals at twelve distinct times in the whole project. The data collection started on 23rd October 2017 and ended on 14th December 2017 on the day of the Sales Gala. The graph was interpreted in various ways to collect information from the candidates. Some of the candidates could relate better with the

axis information, few with the colors and rest with the feelings itself. This data was then segregated in an excel sheet to analyze.

Discipline	Team		1 - Team formation		2 - Design research		generation		4 - Prototyping		5 - Manufacturing		6 - Sales	
			What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation ?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production ?	How do you feel about the pre order experience ?	How do you feel after the final sale?
Business	1	T11	Uneasy	Apathetic	Disheartene	At Ease	Chill	Secure	At Ease	Content	Calm	Satisfied	Pleased	Serene
Design	1	T12	Excited	Worried	Enthusiasti	Energized	Excited	Irritated	Happy	Enthusiasti	Angry	Relaxed	Excited	Festive
Engineer	1	T13	Concerned	Frustrated	Energized	Optimistic	Elated	Content	Motivated	At Ease	At Ease	Tired	Pleasant	Happy
Business	2	T21	Satisfied	Excited	Excited	Hopeful	Playful	Apprehensi	Surprised	Hopeful	Stressed	Satisfied	Hopeful	Inspired
Design	2	T22	Hopeful	Depressed	Optimistic	Concerned	Frustrated	Frustrated	At Ease	Easygoing	Calm	Drained	Apathetic	satisfied
Design	2	T23	Optimistic	Hopeful	Lonely	Lonely	Sleepy	Fulfilled	Inspired	Excited	Fulfilled	Ecstatic	Proud	Fulfilled
Engineer	2	T24	Ecstatic	Ecstatic	Shocked	Restless	Enthusiasti	Optimistic	Excited	Festive	Irritated	Elated	Thrilled	At Ease
Design	3	T31	Nervous	Pleased	Annoyed	Apathetic	Apathetic	At Ease	Energized	Happy	Calm	Tired	Pleasant	Cheerful
Engineer	3	T32	At Ease	Uneasy	Bored	Calm	Easygoing	Satisfied	Complacen	Nervous	Pleasant	Restless	Relaxed	Down
Engineer	3	T33	Pleasant	Optimistic	Ecstatic	Satisfied	Concerned	Mellow	Uneasy	Calm	Frustrated	Mellow	Jittery	Peeved
Business	4	T41	Ecstatic	Optimistic	Hopeful	Excited	Inspired	Energized	Restless	Motivated	Tense	Secure	Focused	Pleased
Design	4	T42	Content	satisfied	Nervous	Hopeful	Excited	Enthusiasti	Anxious	Satisfied	Optimistic	Motivated	Grateful	Disappointe
Engineer	4	T43	Excited	Excited	Nervous	Exhilarated	Inspired	Optimistic	Inspired	Focused	Optimistic	Chill	Calm	Sleepy
Business	5	T51	At Ease	Secure	Enthusiasti	Hopeful	Energized	Uneasy	Worried	Focused	Motivated	Pleased	Apprehensi	Apathetic
Design	5	T52	Enthusiasti	Pleased	Optimistic	Uneasy	Motivated	Nervous	Restless	Hopeful	Jittery	Tired	Pleased	Drained
Engineer	5	T53	Pleased	Energized	Apprehensi	Focused	Concerned	Anxious	Uneasy	Pleasant	Restless	Energized	Anxious	Disappointe
Business	6	T61	Thrilled	Thrilled	Nervous	Optimistic	At Ease	Pleased	Enthusiasti	Optimistic	Frustrated	Relaxed	Hopeful	Elated
Design	6	T62	Excited	Hopeful	Happy	Chill	Apathetic	Nervous	Uneasy	Motivated	Panicked	Apprehensi	Inspired	Excited
Engineer	6	T63	Motivated	Upbeat	Happy	Restless	Lively	Concerned	Annoyed	Peeved	Apprehensi	Exhilarated	Optimistic	Pleased
Business	7	T71	Apathetic	Pleasant	Frustrated	Relaxed	Drained	Pleased	Tired	Inspired	Frustrated	Irritated	Discourage	Playful
Design	7	T72	Disappointe	Anxious	Hopeful	Happy	Exhausted	Uneasy	Drained	Excited	Concerned	Pleased	Nervous	Drained
Engineer	7	T73	Concerned	Uneasy	Hopeful	Satisfied	Lively	Jittery	Restless	Satisfied	Nervous	Proud	Optimistic	Tired

Table B.3: Emotion documentation

Having a sample size of 22 candidates made it hard to get consistent data as there were 100 data points on the mood meter. Using statistical analysis, I segmented the mood meter data points into five sub sections as: chronic disablers, disablers, neutral, enablers and chronic enablers. This segmentation was then overlayed with the mood meter data points to plot the data on graphs.

0	1	1	2	2	3	3	4	4	4
0	1	1	2	2	3	3	4	4	4
0	1	1	2	2	3	3	4	4	4
0	1	1	2	2	2	3	3	4	4
0	1	1	2	2	2	3	3	4	4
0	0	1	1	2	2	2	3	3	4
0	0	1	1	2	2	2	3	3	4
0	0	0	1	1	2	2	2	3	3
0	0	0	1	1	2	2	2	3	3
0	0	0	1	1	2	2	2	3	3

Figure A.3: Mood meter segmentation

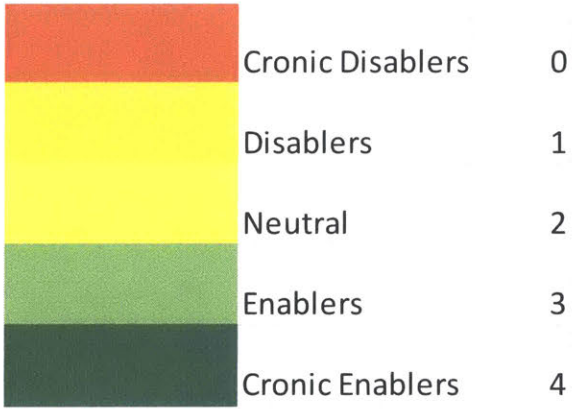


Figure A.4: Color coding for mood segments

Enraged	Panicked	Stressed	Jittery	Shocked	Surprised	Upbeat	Festive	Exhilarated	Ecstatic
livid	Furious	Frustrated	Tense	Stunned	Hyper	Cheerful	Motivated	Inspired	Elated
fuming	Frightened	Angry	Nervous	Restless	Energized	Lively	Enthusiastic	Optimistic	Excited
anxious	Apprehensiv	Worried	Irritated	Annoyed	Pleased	Happy	Focused	Proud	Thrilled
repulsed	Troubled	Concerned	Uneasy	Peeved	Pleasant	Joyful	Hopeful	Playful	Blissful
disgusted	Glum	Disappointed	Down	Apathetic	At Ease	Easygoing	Content	Loving	Fulfilled
pessismistic	morose	Discouraged	Sad	Bored	Calm	Secure	Satisfied	Grateful	Touched
alienated	miserable	lonely	Disheartened	Tired	Relaxed	Chill	Restful	Blessed	Balanced
despondent	depressed	sullen	exhausted	fatigued	Mellow	Thoughtful	Peaceful	Comfy	Carefree
despair	panicked	desolate	spent	drained	sleepy	complacent	tranquil	cozy	serene

Figure A.5: Segmentation of mood meter

3.3 Analysis of Teams Emotions

Once the data for all the teams was collected using the mood meter shown in Figure A.2, it is segmented and documented in the excel sheet. Using the segmented points for the teams a line graph is plotted to observe patterns within teams for disciplines.

Team 1

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research ?	How did you feel at the end of the research ?	How did you feel about generating concepts after your research ?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T11	2	2	1	2	2	2	2	3	2	3	2	3
Design	T12	4	1	4	3	4	2	3	4	1	2	4	4
Engineer	T13	1	1	3	4	4	3	4	2	2	1	2	3

Table B.4: Team 1 emotion documentation

The designer T12 in this team starts with chronic enabling feelings and drops very low in the second phase, whereas the business and the engineer start low and don't experience a lot of change in the emotions. On average, the business team member T11 doesn't show extreme variations in the emotions throughout the project in the different phases. If we closely observe the designer and the engineer's emotions fluctuate together. There could be several reasons effecting this fluctuation. The fluctuation in emotion segments can be counted by adding the difference in segments taking the starting segment as a reference point. The fluctuation in emotion segment were as follows: designer - 19, business – 7 and engineering – 10. All the

team members reached a high right after the sales gala, this could be as this was one of the teams who were able to sell all the units they made. Success is also attributed to the expectation of the team members from the project, from each other or other reasons which were not counted in this study.

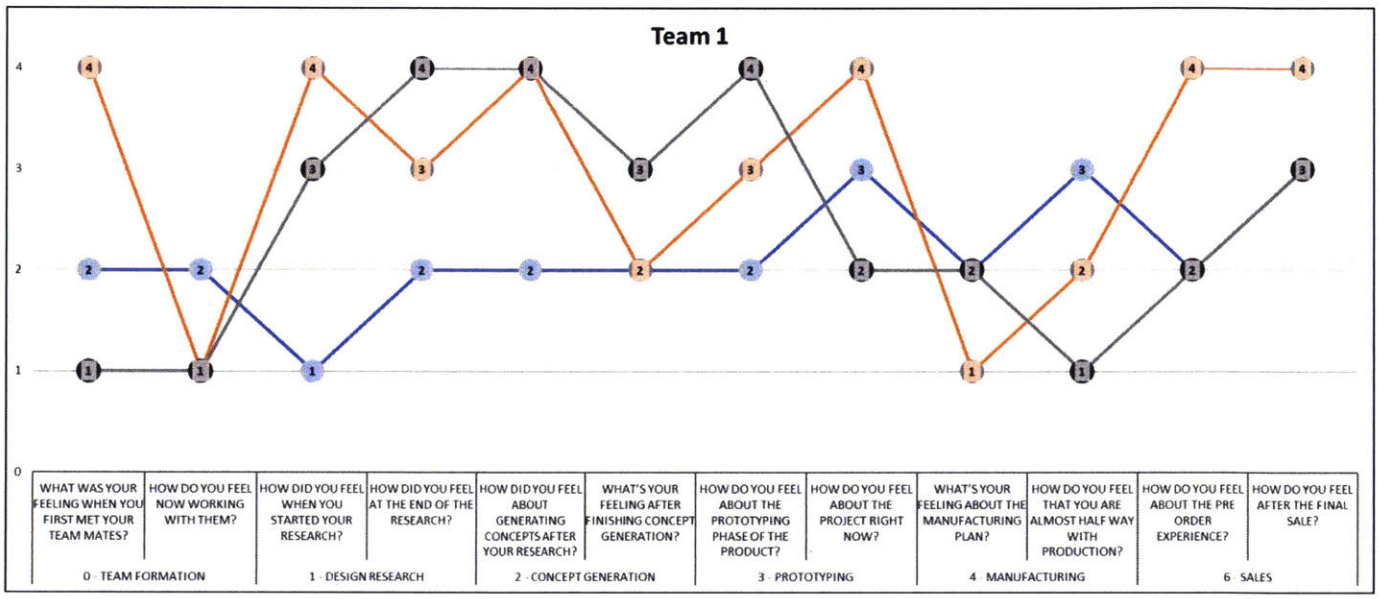


Figure A.6: Line graph for team 1

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

Engineering
Design
Business

The survey for confounding variables revealed that the engineer and the designer felt that the team members were the major factors affecting their emotions throughout the project. The team had problems related to team dynamics in the starting of the project which was one of the

observations while collecting data. Although the team had team conflicts none of the team members ever reached chronic disabling emotion segment.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	1	T11			yes	
Design	1	T12	yes			
Engineer	1	T13	yes			

Table B.5: Team 1 confounding variables

Team 2

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research ?	How did you feel at the end of the research ?	How did you feel about generating concepts after your research ?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T21	3	4	4	3	4	1	3	3	1	3	3	4
Design	T22	3	0	4	1	1	1	2	2	2	1	4	3
Design	T23	4	3	0	0	2	4	4	4	4	4	4	4
Engineer	T24	4	4	2	2	4	4	4	4	2	4	4	2

Table B.6: Team 2 emotion documentation

Team 2 was a team of four members as there were 22 students in the IDM cohort. Two of them were designers and others were business and engineering. All the team members started with enabling emotions, but in the second phase both the designer's emotions dropped by several points. In the third phase one of the designers was in chronic disabling emotion segment. The fluctuation in emotion segment were as follows: designer T22 – 16, designer T23 - 8, business – 13 and engineering – 10. There doesn't seem to be any correlation in the fluctuation of emotion segments in team 2. Although the designer T23 had the least fluctuations but T23

remained in the disabling emotion segment for most of the time of the project. All the team members were almost at the same emotional level after the sales gala compared to what they started with. Success is also attributed to the expectation of the team members from the project, from each other or other reasons which were not counted in this study.

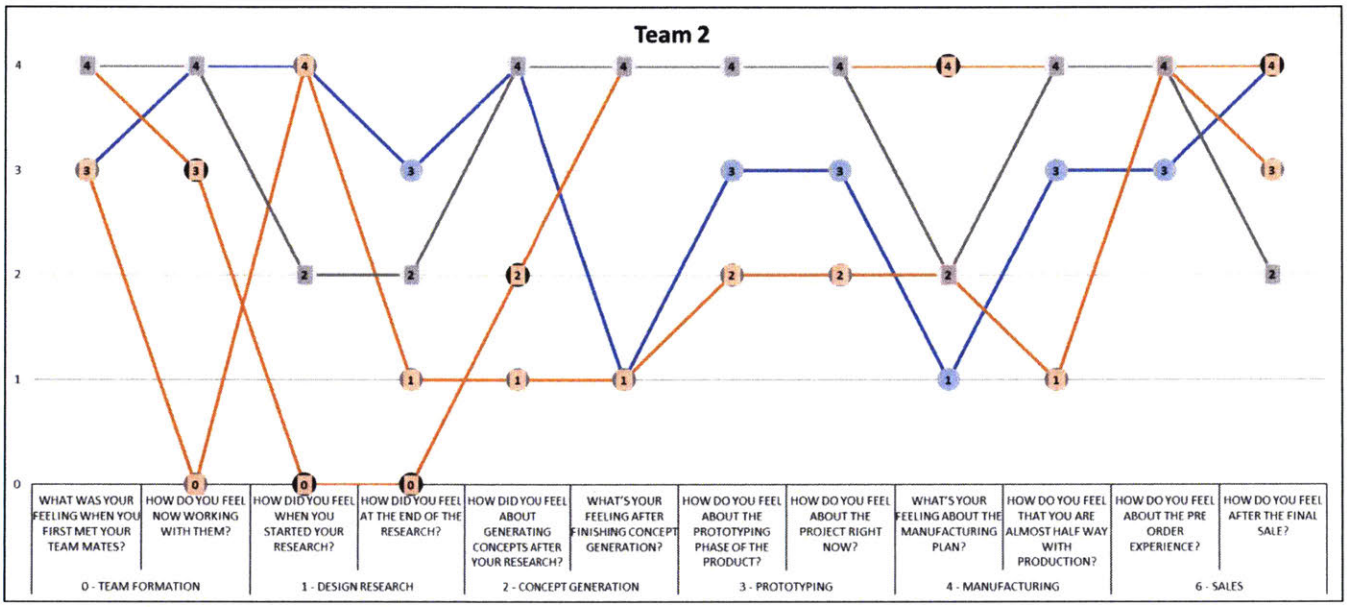


Figure A.7: Line graph for team 2

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

	Engineering
	Design
	Business

The factors that affected her emotions in the project were the "the product itself and the design", when I asked her what that means T23 said that "I am not interested in contributing much as I don't like the design of the product and it is really hard to convince the other

members." This made T23 less interested in the project and thus her emotions stayed in the disabling segment for most of the time. Others stated that the team members were the reason for their emotions.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	2	T21	yes			
Design	2	T22	yes			
Design	2	T23				The product itself and the design
Engineer	2	T24	yes			

Table B.6: Team 2 confounding variables

Team 3

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research ?	How did you feel at the end of the research ?	How did you feel about generating concepts after your research ?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T31	2	2	2	2	2	2	3	3	2	1	2	3
Engineer	T32	2	2	2	2	2	3	2	2	2	2	2	1
Engineer	T33	2	4	4	3	1	2	2	2	1	2	2	2

Table B.7: Team 3 emotion documentation

This team had two engineers and one business person. None of the team members here ever hit the chronic disabling segment. The fluctuation in emotion segment were as follows: engineering T32 – 5, engineering T33 – 8 and business T33 – 5. The business T33 member had almost the same emotion fluctuation compared to others. The starting point for all the team

members was neutral emotions, but one of the engineers T33 had chronic enabling emotions and then dropped to disabling emotions. All the team members stayed almost at the same emotion level after the sales gala.

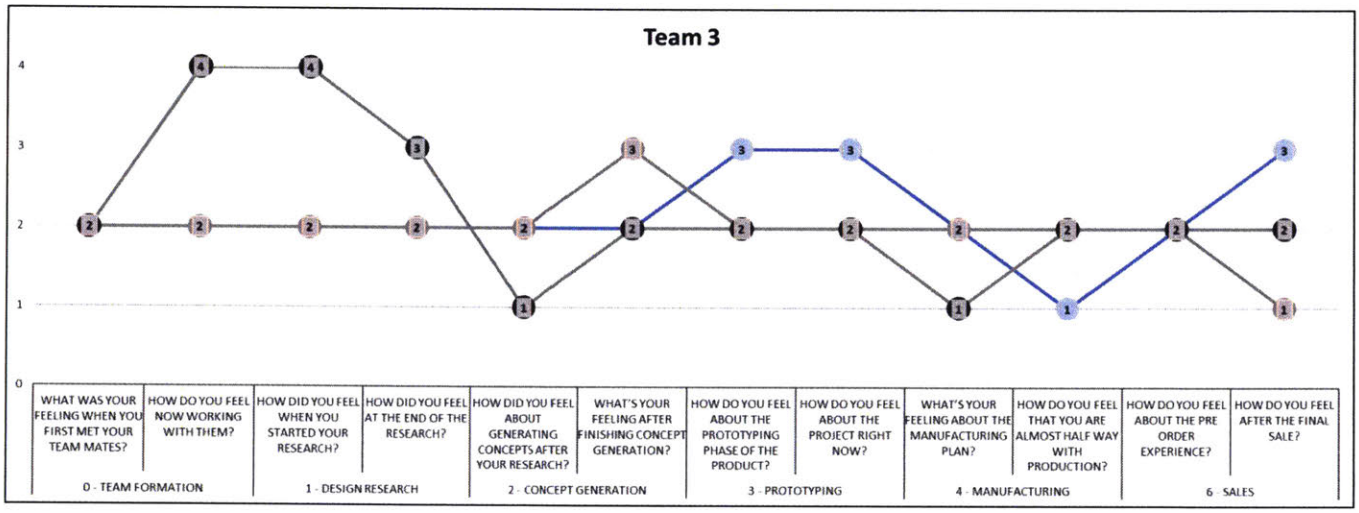


Figure A.8: Line graph for team 3

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

	Engineering
	Design
	Business

Success is also attributed to the expectation of the team members from the project, from each other or other reasons which were not counted in this study. The survey for confounding variables revealed that all the team members felt that team members affect the emotion the most. Engineer T32 was effected by many variables other than the project. T32 had external variables acting on him and also seemed to be disappointed as the team couldn't sell all the units the planned to.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Design	3	T31	yes			
Engineer	3	T32	yes	yes	yes	bit "down" after not selling out
Engineer	3	T33	yes			

Table B.7: Team 3 confounding variables

Team 4

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research ?	How did you feel at the end of the research ?	How did you feel about generating concepts after your research ?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T41	4	4	3	4	4	3	2	4	2	2	3	2
Design	T42	3	3	2	3	4	4	0	3	4	4	3	1
Engineer	T43	4	4	2	4	4	4	4	3	4	2	2	2

Table B.8: Team 4 emotion documentation

Team 4 was a uniformly distributed team in terms of disciplines. They all started with high enabling emotions. The fluctuation in emotion segment were as follows: engineering T43 – 8, BusinessT41 – 10 and design T42 – 14. Team 4 is similar to team 1 as the designer had the most fluctuations. The designer also hit the chronic disabling emotions segment in phase 5 of the project, the business candidate also dipped down in emotions by two points in that phase. All the team members saw a dip in the emotional level after the sales gala compared to what they started from.

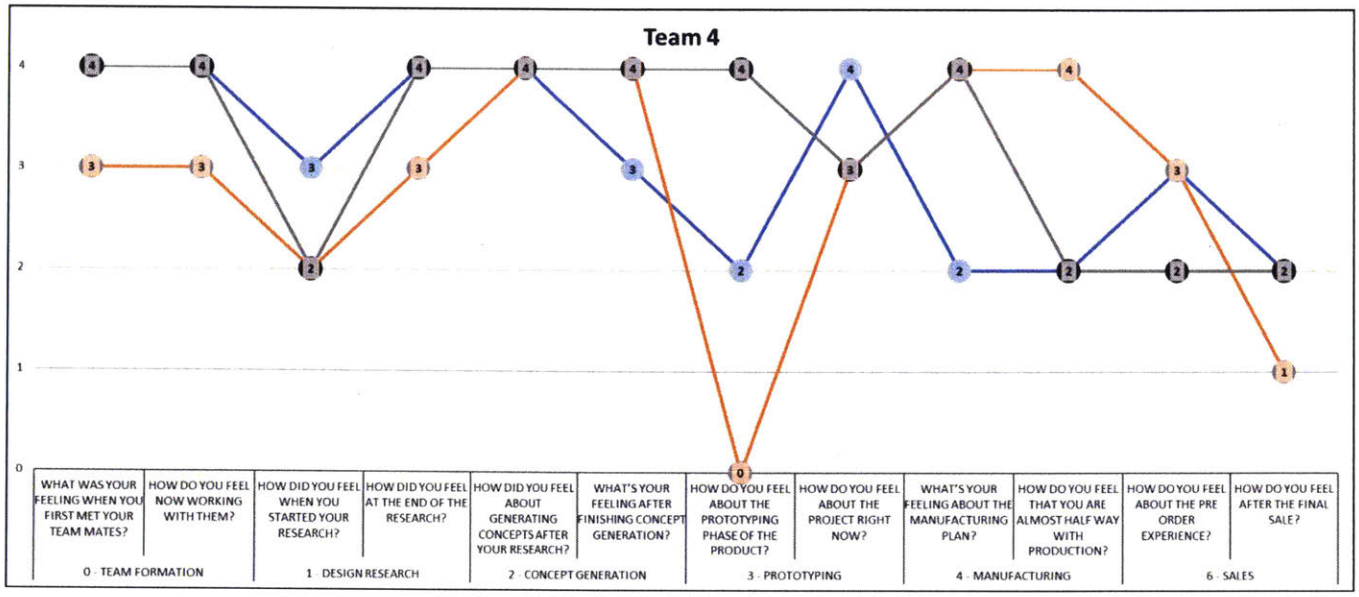
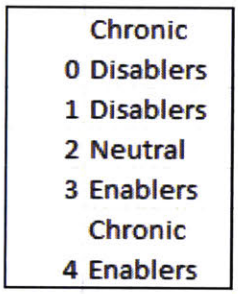
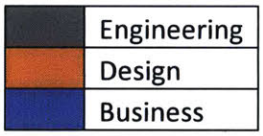


Figure A.9: Line graph for team 4





The designer and the business team member both felt that the team member were the reasons for the emotions in the project. This also reflected in the graph as the emotions of the designers and the business member dropped and hiked together in the phases of the project. The business candidate also indicated some ambiguity in the project which affected T41's emotions.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	4	T41	yes			ambiguity around
Design	4	T42	yes		yes	
Engineer	4	T43		yes		

Table B.8: Team 4 confounding variables

Team 5

This team has all the three disciplines like most of the teams. Business and engineering candidates start with neutral emotions and the designer is at a chronic enabling emotion segment. The fluctuation in emotion segment were as follows: designer - 15, business – 14 and engineering – 15. The fluctuations in emotions were comparable for all disciplines in this team.

Discipline	Name	**0 - Team formation**		**1 - Design research**		**2 - Concept**		**3 - Prototyping**		**4 - Manufacturing**		**6 - Sales**	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research ?	How did you feel at the end of the research ?	How did you feel about generating concepts after your research ?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T51	2	2	4	3	3	2	1	3	4	2	1	4
Design	T52	4	2	4	2	4	2	2	3	2	1	2	1
Engineer	T53	2	3	1	3	1	0	2	2	2	3	0	1

Table B.9: Team 5 emotion documentation

If we closely observe the designer and the engineer's emotions fluctuate in completely opposite segments. There could be several reasons effecting this fluctuation. The business candidate was at a chronic enabling emotion segment whereas the engineering and designer candidates

were at disabling emotion segment. The engineer in this team never reached a chronic enabling emotion segment, this could be because their product was engineering intense product resulting in difficult situations.

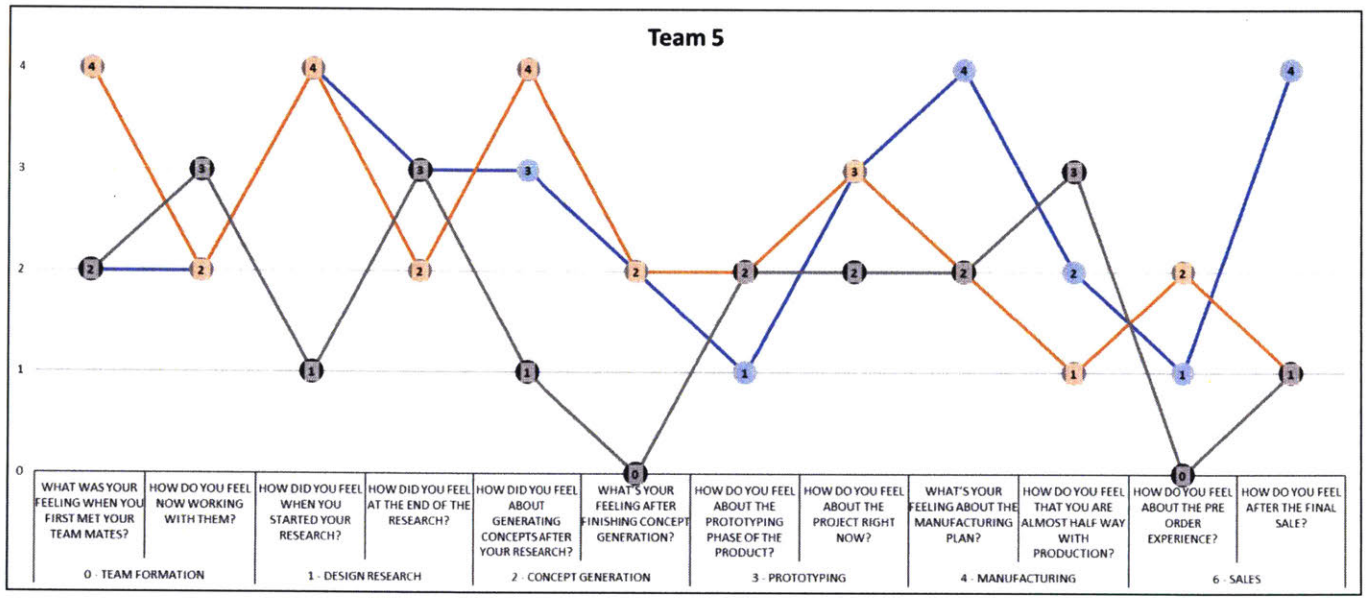


Figure A.10: Line graph for team 5

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

	Engineering
	Design
	Business

All the members suggested that their emotions were a result of the relationship with the team members. The designer was not very confident of the pricing skills and this might be one of the factors for the agitation in the emotions in the project.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	5	T51	yes			
Design	5	T52	yes			not confident in my skills in pricing
Engineer	5	T53	yes			

Table B.9: Team 5 confounding variables

Team 6

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T61	4	4	2	4	2	2	4	4	1	2	3	4
Design	T62	4	3	3	2	2	2	2	4	0	1	4	4
Engineer	T63	4	3	3	2	3	1	2	3	1	4	4	2

Table B.10: Team 6 emotion documentation

All the team members in this team started with a chronic enabling emotions segment which shows that they were enthusiastic about the project when they started. The fluctuation in emotion segment were as follows: designer - 12, business – 14 and engineering – 14. The emotion fluctuations were comparable among all the disciplines throughout the phases of the project. The whole team hit a low segment at the manufacturing phase of the project. This shows that they were affected by the manufacturing of the project phase although they were at a high state at the prototyping phase. They were quite excited with the product itself but

external factors like machinery and other courses changed their emotions. The team's designer and business candidate reached a chronic enabling emotion segment at the sales gala, whereas the engineering candidate remained neutral. The product was engineering intense and the engineer reached a high emotional segment right after the manufacturing was completed.

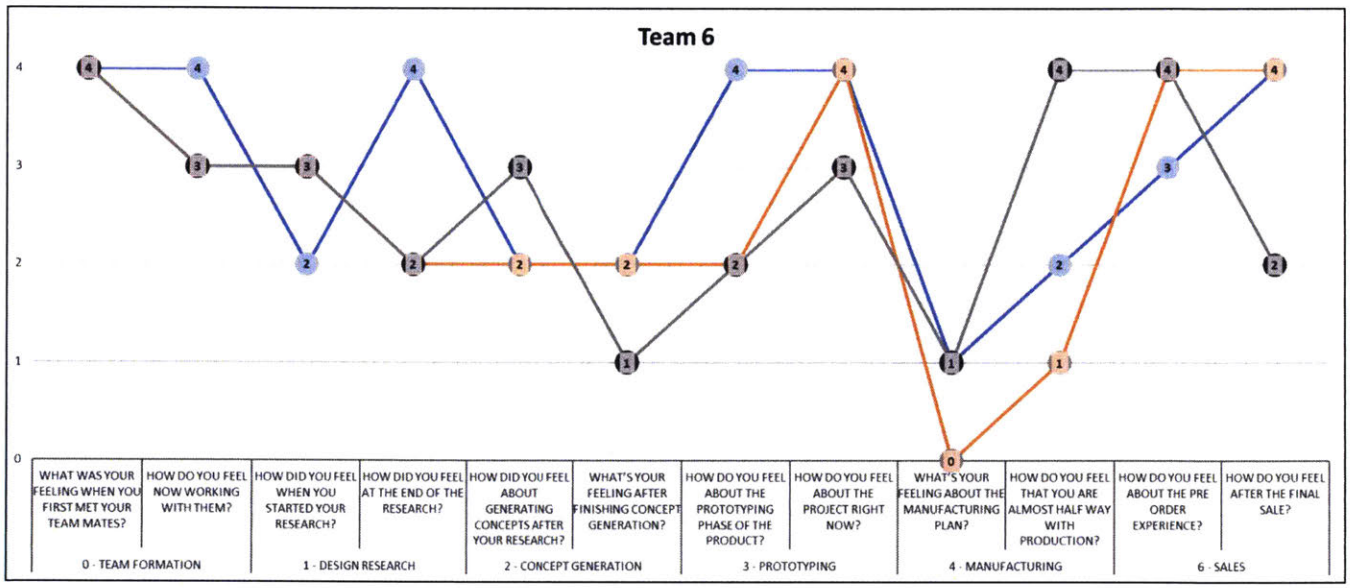


Figure A.11: Line graph for team 6

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

	Engineering
	Design
	Business

They were quite excited with the product itself but external factors like machinery and other courses changed their emotions. The team's designer and business candidate reached a chronic enabling emotion segment at the sales gala, whereas the engineering candidate remained neutral. The product was engineering intense and the engineer reached a high emotional

segment right after the manufacturing was completed. The confounding variables survey also revealed that the engineer was affected by the machine shop partners and the instructors. The designer and the business candidate were affected by other courses in the semester.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	6	T61	yes	yes	yes	
Design	6	T62			yes	yes
Engineer	6	T63				being interfacing with the instructors and machine shop partners

Table B.10: Team 6 confounding variables

Team 7

Discipline	Name	0 - Team formation		1 - Design research		2 - Concept		3 - Prototyping		4 - Manufacturing		6 - Sales	
		What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production?	How do you feel about the pre order experience?	How do you feel after the final sale?
		1	2	3	4	5	6	7	8	9	10	11	12
Business	T71	2	2	1	2	1	2	1	4	1	2	1	4
Design	T72	1	0	3	3	1	2	1	4	1	2	2	1
Engineer	T73	1	2	3	3	3	2	2	3	1	4	4	1

Table B.11: Team 7 emotion documentation

All the team members in this team started with a neutral and disabling emotions, this could be interpreted as they were not very excited about the team formation phase. This team didn't hit the chronic enabling emotion segment until the prototyping phase although the designer did hit the chronic disabling phase in the second phase. This shows that the team had difficulty

adjusting in the initial phases of the project. They seemed to strike a balance with the decision of finalizing the design of the product as the emotions graph fluctuated together. The fluctuation in emotion segment were as follows: designer - 16, business – 15 and engineering – 12. The emotion fluctuations were comparable among all the disciplines throughout the phases of the project. The whole team hit a low segment at the manufacturing phase of the project. This shows that they were affected by the manufacturing of the project phase although they were at a high state at the prototyping phase. They were quite excited with the product itself but external factors like manufacturing process and time changed their emotions. The product was engineering intense and the engineer reached a high emotional segment right after the manufacturing was completed

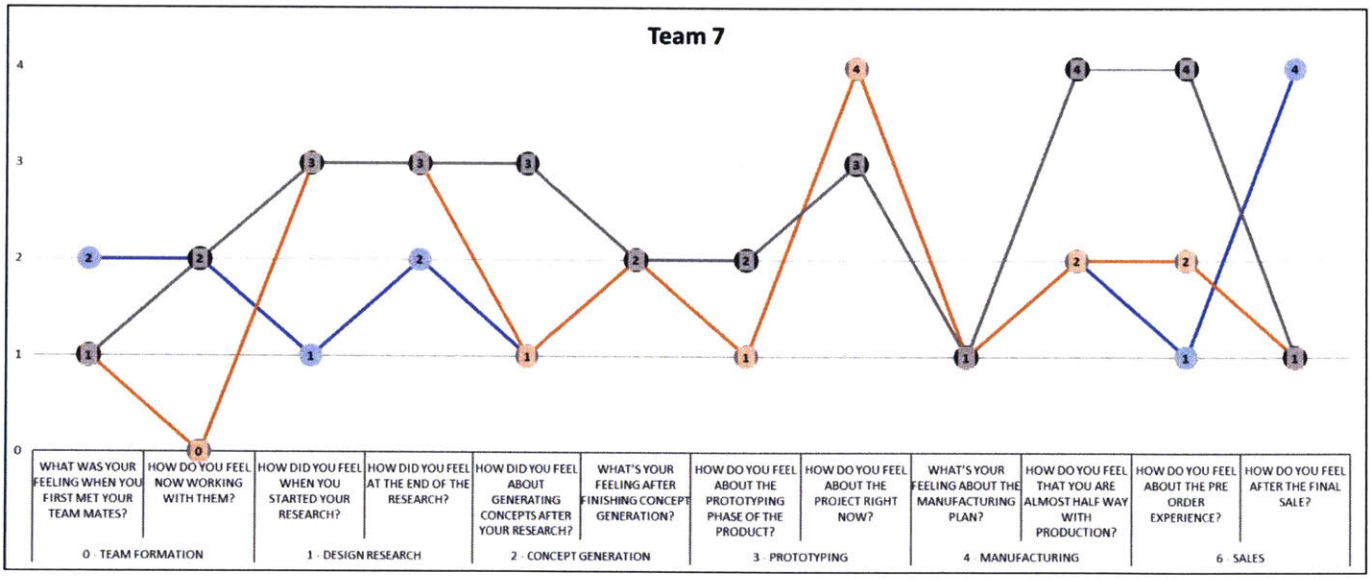


Figure A.11: Line graph for team 7

Chronic
0 Disablers
1 Disablers
2 Neutral
3 Enablers
Chronic
4 Enablers

	Engineering
	Design
	Business

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	7	T71		yes		
Design	7	T72	yes		yes	personal expectations of myself and feelings towards the nature of the project
Engineer	7	T73	yes			

Table B.11: Team 7 confounding variables

They were quite excited with the product itself but external factors like machinery, other courses and project deadlines affected their emotions. The team members reached enabling emotion segment before the sales gala, with engineer at the chronic enabling emotion segment. The business candidate reached a chronic enabling emotional segment at the sales gala, but the other two members were low.

3.4 Emotion Analysis for Disciplines

When we look at the mood meter discipline graphs, we could interpret few things by observing their fluctuations.

Engineering

The engineering discipline candidates reached the chronic enabling emotion segment for a total of 25 times. There was no specific phase which attributed this high value as per the graph. They reached the chronic disabling emotional segment twice throughout the project. This shows that they were not really in a disabling segment in the project. They were at neutral emotional segment for 39 times in the project, which is not a bad thing for the project.

Discipline	Team		0 - Team formation		1 - Design research		2 - Concept generation		3 - Prototyping		4 - Manufacturing		6 - Sales	
			What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation ?	How do you feel about the prototypin g phase of the product?	How do you feel about the project right now?	What's your feeling about the manufactur ing plan?	How do you feel that you are almost half way with production ?	How do you feel about the pre order experience ?	How do you feel after the final sale?
Engineer	1	T13	1	1	3	4	4	3	4	2	2	1	2	3
Engineer	2	T24	4	4	2	2	4	4	4	4	2	4	4	2
Engineer	3	T32	2	2	2	2	2	3	2	2	2	2	2	1
Engineer	3	T33	2	4	4	3	1	2	2	2	1	2	2	2
Engineer	4	T43	4	4	2	4	4	4	4	3	4	2	2	2
Engineer	5	T53	2	3	1	3	1	0	2	2	2	3	0	1
Engineer	6	T63	4	3	3	2	3	1	2	3	1	4	4	2
Engineer	7	T73	1	2	3	3	3	2	2	3	1	4	4	1

Table B.12: Engineering emotion documentation

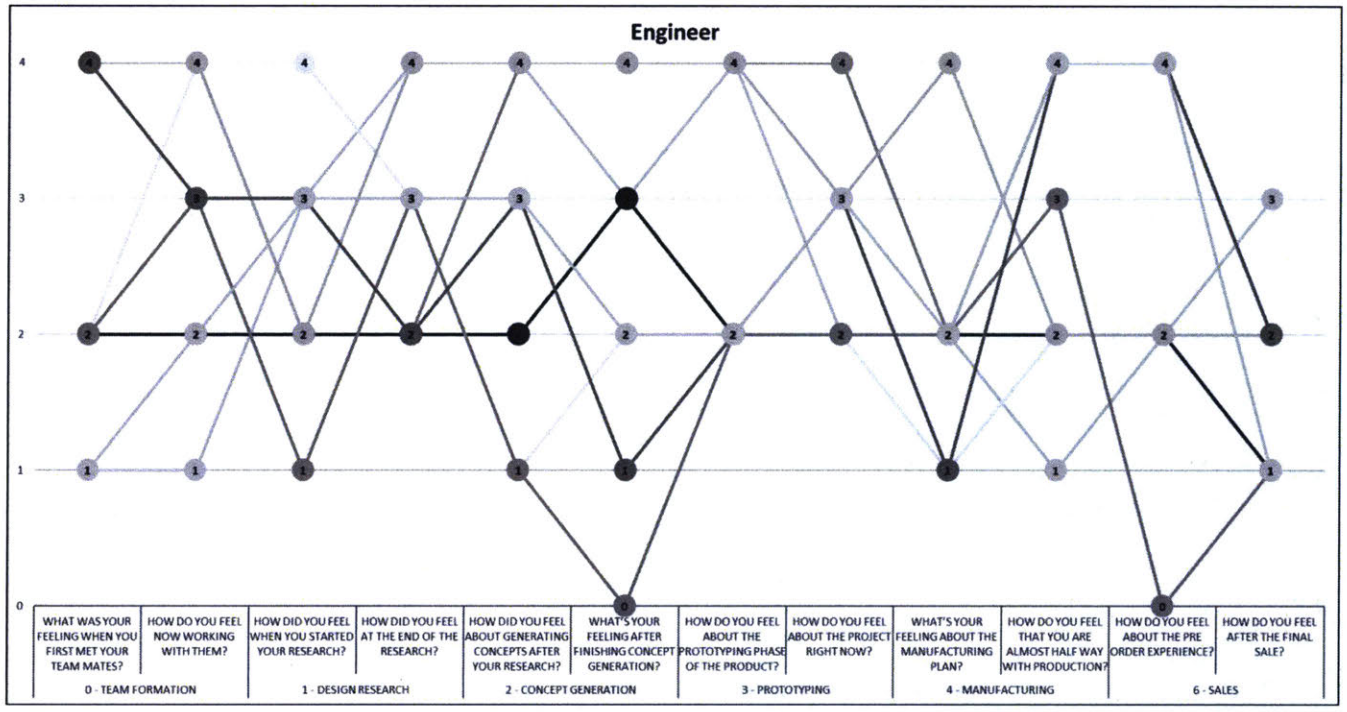


Figure A.12: Line graph for engineering discipline

Design

The design discipline candidates reached the chronic enabling emotion segment for a total of 28 times. There was no specific phase which attributed this high value as per the graph. They

reached the chronic disabling emotional segment, 6 times throughout the project. This shows that they had significant emotional shifts while in the project. They were at neutral emotional segment for 28 times in the project, which is less compared to engineering discipline. The designers experienced extreme emotional fluctuations compared to the engineering discipline. The designers experienced great fluctuation during the team formation phase and the design research phase of the project. Most of them also reached a high in the prototyping phase when the final design is decided before manufacturing.

Discipline	Team		0 - Team formation		1 - Design research		2 - Concept generation		3 - Prototyping		4 - Manufacturing		6 - Sales	
			What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation ?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production ?	How do you feel about the pre order experience ?	How do you feel after the final sale?
Design	1	T12	4	1	4	3	4	2	3	4	1	2	4	4
Design	2	T22	3	0	4	1	1	1	2	2	2	1	4	3
Design	2	T23	4	3	0	0	2	4	4	4	4	4	4	4
Design	3	T31	2	2	2	2	2	2	3	3	2	1	2	3
Design	4	T42	3	3	2	3	4	4	0	3	4	4	3	1
Design	5	T52	4	2	4	2	4	2	2	3	2	1	2	1
Design	6	T62	4	3	3	2	2	2	2	4	0	1	4	4
Design	7	T72	1	0	3	3	1	2	1	4	1	2	2	1

Table B.13: Design emotion documentation

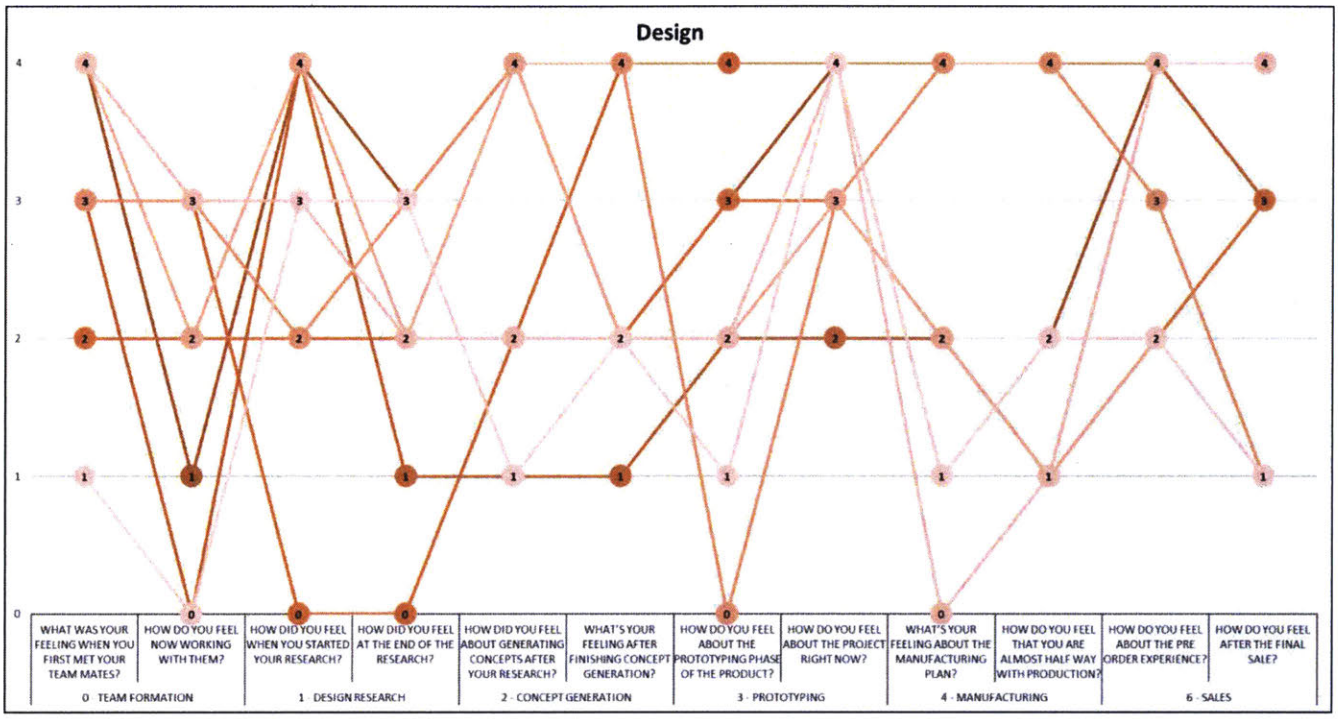


Figure A.13: Line graph for design discipline

Business

The business discipline candidates reached the chronic enabling emotion segment for a total of 20 times. This was the minimum compared to all other disciplines in all the teams. They never reached the chronic disabling emotional segment in the project. This is a major observation compared to all the other disciplines, as they never were very low in emotions. The enabling emotions and disabling emotions of the business discipline were not very extreme which makes them a balanced set of discipline. They were at neutral emotional segment for 25 times in the project. Most of the business candidates were at the chronic enabling emotional segment at the end of the project, this could be because of the sales of the product, nevertheless there could be several other reasons affecting this. The business discipline hit a high in the prototyping phase which is similar to the design discipline.

Discipline	Team		0 - Team formation		1 - Design research		2 - Concept generation		3 - Prototyping		4 - Manufacturing		6 - Sales	
			What was your feeling when you first met your team mates?	How do you feel now working with them?	How did you feel when you started your research?	How did you feel at the end of the research?	How did you feel about generating concepts after your research?	What's your feeling after finishing concept generation ?	How do you feel about the prototyping phase of the product?	How do you feel about the project right now?	What's your feeling about the manufacturing plan?	How do you feel that you are almost half way with production ?	How do you feel about the pre order experience ?	How do you feel after the final sale?
Business	1	T11	2	2	1	2	2	2	2	3	2	3	2	3
Business	2	T21	3	4	4	3	4	1	3	3	1	3	3	4
Business	4	T41	4	4	3	4	4	3	2	4	2	2	3	2
Business	5	T51	2	2	4	3	3	2	1	3	4	2	1	4
Business	6	T61	4	4	2	4	2	2	4	4	1	2	3	4
Business	7	T71	2	2	1	2	1	2	1	4	1	2	1	4

Table B.14: Business emotion documentation

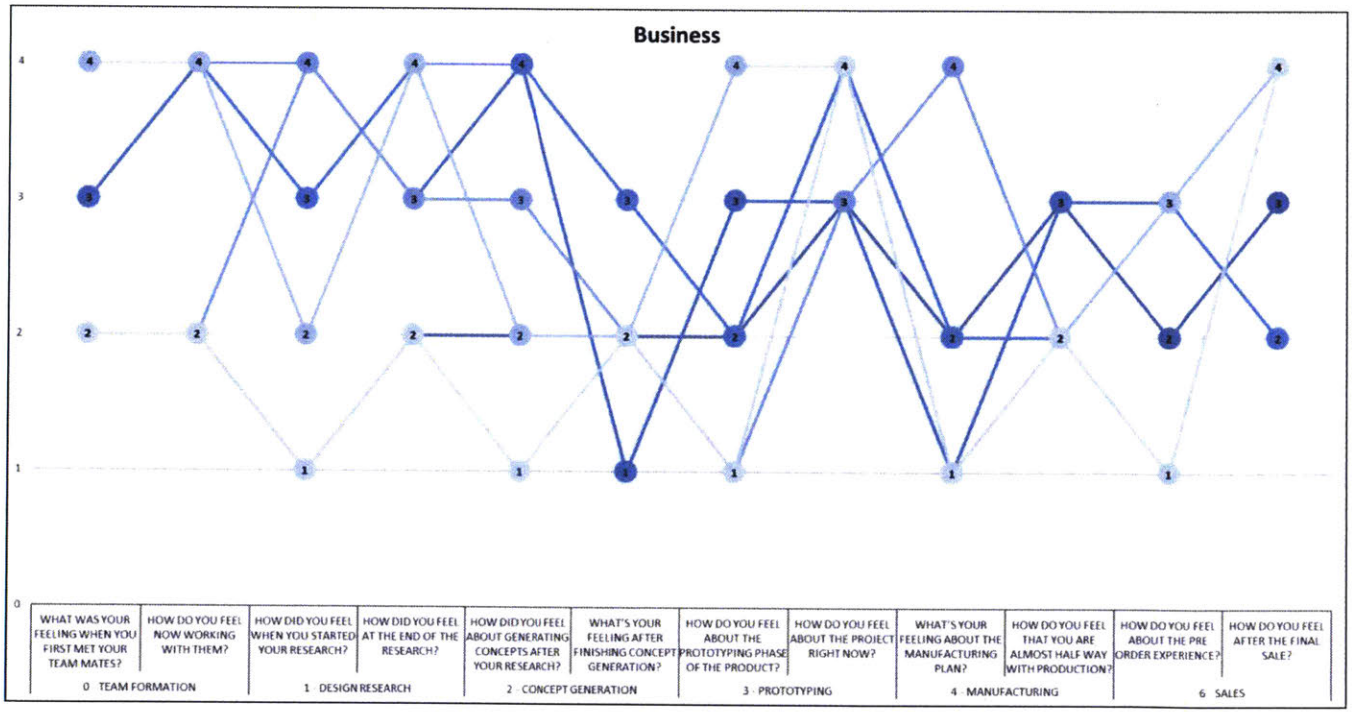


Figure A.14: Line graph for business discipline

3.5 Confounding Variables Effecting Individuals

After the collection of the data using the mood meter the team individuals were asked to fill out a survey sheet with just one question. The multiple options in the question were decided based on the discussions that I had with the team members over the time of the project. I compiled all the reasons stated by them and asked them to pick their options. This was to understand the reasons which affected their emotion over the project.

What were the major factors effecting your feelings throughout the project. (Pick one or more)

a. Team members

b. Project deadlines

c. Other courses

d. Others (please specify)

A major 68% of the team members picked team members as their primary reason for their emotions in the project. This could be for multiple reasons, which was not covered in this study. 41% of the team members also stated that they had other reasons which influenced their emotions.

What were the major factors effecting your feelings throughout the project. (Pick one or more)						
Discipline	Team		a. Team members	b. Project deadlines	c. Other courses	d. Others (please specify)
Business	1	T11			yes	
Design	1	T12	yes			
Engineer	1	T13	yes			
Business	2	T21	yes			internal pressure to do well
Design	2	T22	yes			
Design	2	T23				The product itself and the design
Engineer	2	T24				going home
Design	3	T31	yes			
Engineer	3	T32	yes	yes	yes	bit "down" after not selling out
Engineer	3	T33	yes			
Business	4	T41	yes			ambiguity around product (when testing failed or there was misalignment)
Design	4	T42	yes		yes	
Engineer	4	T43		yes		
Business	5	T51	yes			
Design	5	T52	yes			not confident in my skills in pricing and managing timing.
Engineer	5	T53	yes			
Business	6	T61	yes	yes	yes	
Design	6	T62			yes	yes
Engineer	6	T63				being interfacing with the instructors and machine shop partners
Business	7	T71		yes		
Design	7	T72	yes		yes	personal expectations of myself and feelings towards the nature of the project
Engineer	7	T73	yes			

Table B.15: Confounding variables for all teams

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Chapter 4

Conclusion

As stated in the previous section, the results cannot be conclusive until more research is conducted with emotional intelligence of a product development multi-disciplinary team used in this study. Only then people will be able to build successful multidisciplinary product development teams working together in cohesion to develop successful products. The following plan can provide steps to achieve accuracy:

1. Include confounding variables which effect the teams' performance and emotional intelligence. The variables collected in this study could be taken as a baseline for creating a metric and could be further appended.
2. A success metric could be added to the study to understand the emotions changing based on the expectations of the team members success.
3. Managing the amount of uncertainties that teams come across is the key to better performance. It depends on the attitude and the psychology of the team member.

4. The mood meter should be redesigned so that the data points are less than the sample size of the teams. There would be overlap in the data points and will give conclusive results for the individuals.
5. These conclusions may not be generalized and extrapolated to all cross-function teams in the industry.

Successful multi-disciplinary teams pave the path for successful businesses. Emotional intelligence is one of the major factors influencing collaboration of the team members within an organization. Honing emotional intelligence in such teams will increase the throughput of teams efficiency and yield successful products. The growing market and industries are opting for leaders and managers who work well in multi-disciplinary environments. How do these leaders account for other factors which effect the productivity of the teams? Are they capable of recognizing opportunities for the projects and the team members? How do successful managers, who have brought in positive change to the teams, continue to perform better, across volatile markets and uncertainties? Can they implement the same strategies for different teams across various products and industries? How can these leaders strike a balance between environmental and mentorship influences and the inherent willingness and abilities of a team? Multi-disciplinary product development teams are ubiquitous and necessary for companies competing in market share or for competitive advantage.

Hopefully answers to these questions will help these teams attain the high quality, successful outcome.

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Additional Resources

http://ei.yale.edu/ruler/ruler-online-course/

https://link.springer.com/book/10.1007/978-3-319-18687-0?no-access=true

https://psychcentral.com/lib/what-is-emotional-intelligence-eq/

https://www.affective-sciences.org/gew/

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0148037

http://www.free-management-ebooks.com/faqpp/developing-03.htm

http://www.maetrix.com.au/emotional-intelligence/