# 2013

PSU-ETM 527/627: Competitive Strategies in Technology Management – Spring'13 Term

Instructor: Dr Ron Khormaei

Team:

Tila Bregaj Judith Estep Thanaporn Ngarmnil Mehdi Toobaei

# [FINAL REPORT: DR. ALAVI]

# **Challenges in Managing Innovation by Dr. Hossein Alavi**

## **Background: INTEL**

Intel Corporation is the largest semiconductor manufacturer in the world, headquartered in Santa Clara, California. The company employs approximately 100, 100 people in its eleven fabrication facilities and six assembly and test facilities around the world, which have combined advanced chip design capability with a leading-edge manufacturing capability. It is the inventor of the x86 series of microprocessors, the processors found in most personal computers. Intel Corporation was founded in July 18, 1968 by semiconductor pioneers Robert Noyce, Gordon Moore, and widely associated with the executive leadership and vision of Andrew Grove. Intel also makes motherboard chipsets, network interface controllers and integrated circuits, flash memory, graphic chips, embedded processors and other devices related to communications and computing.

One of Intel's major investments is in R&D. What makes Intel the biggest chip manufacturing company is keeping up with rapid changes in the microprocessor industry and constantly investing in R&D. Intel is number 4 in the list of top 10 spending R&D Companies at \$8.4 billion in R&D spending in 2012 alone **[1]**. Two main sectors of Intel's R&D are: Intel Labs, (which Dr. Alavi works in) and Intel Manufacturing (TMG Group) which is part of the Logic Technology Development Group (LTD) and consists of 17,000 employees here in Hillsboro, OR.

#### 1.1. Intel Labs

Intel's R&D Network consists of 22 labs across 10 Countries in areas such as Open Innovation and Research, Enterprise Systems and Services, Sustainability, and Embedded and Automotive. Intel has five major Intel Labs, the biggest ones are in the U.S, Europe, and China. Among them, it has many academic programs and research areas. To mention a few: Academic Programs and Research, Circuits and Systems Research, Integrated Platforms Research, Interaction and Experience Research, and Microprocessor and Programming Research. Intel knows the importance of external organization in R&D, collaborative partnerships with research areas and universities. For example, The Academic Research Office funds research with grants of various sizes, as well as large strategic programs championed by Intel employees. The academic programs office manages academic relationships with focus schools and increases Intel technologies on campuses. The lablets, staffed by Intel employees, conduct research with close partnership with the university researchers and students, primarily in the areas of Connected Systems for Communities (with University of California at Berkeley); Cloud Computing Systems and Embedded Real-time Intelligent Systems (with Carnegie Melon University in Pittsburgh); Sensor driven Computing Systems (with University of Washington, Seattle).

#### **1.2. Intel Labs Europe**

Intel R&D / Innovation in Europe is driven by a network of research labs, product development labs and innovation labs spanning the region as well as a variety of Intel business units. Intel Labs Europe (ILE) was formally established in early 2009 as the central means of coordinating activities across this diverse and extensive network, and to strengthen and improve Intel's alignment with European R&D. Today ILE consists of more than 40 R&D locations employing more than 3700 R&D professionals. **[2]** The mission of ILE is to advance Intel research, development and innovation and to partner with European stakeholders to help improve European

competitiveness. To achieve this ILE aims to strengthen Intel's relationships and collaborations with European researchers and to align the company's technology vision with European policy makers across a broad technology agenda. ILE has grown existing initiatives and continually seeks new opportunities to advance the value of ICT solutions for society and business. Recent exciting areas of focus include next-generation Intel Architecture, visual computing, software service development, enterprise solutions, sustainability, embedded computing and high performance computing.

#### 1.3. Intel Labs China

Intel Labs China strives to become a world-class Embedded Systems research institute delivering breakthrough technologies to enable, foster, and improve Intel business opportunities in China and around the world with teams in system integration, architecture, software, and hardware co-design. Intel Labs China is one of five Intel Labs, and is the largest non-U.S. Intel research group. Through world-class research, with a commitment to understanding and adapting to local development requirements, Intel Labs China strives to forge a strong partnership with China in technological innovation and economic development endeavors.

### 1.4. Intel Into the Future

Intel has invested a big portion of its revenue in R&D. In the last 2 years, Intel produced 32nm chips called "Sandy Bridge" and just last summer released its first 22nm tri-gate technology called "IVY Bridge". Intel is the first one to have come up with the 22nm technology after 10 years of research. Up until now, transistor layouts were "planar" or flat, in relation to the die. As Skaugen, Intel's head of PC client, says "the difference here is that 3D trigate transistors enable us to pack significantly higher transistor density on the die, helping increase the chips' performance and energy efficiency."[3] Each processor contains over 1.4 billion transistors. The process has become so difficult that to go even smaller to 14nm this year and reduce the power to half; it will be a great challenge.

Intel has its own collaborative partnerships with research centers, universities, and other companies. In fact, Intel is working on its next 450mm wafer manufacturing Intel labs in NY and partnerships with Google, Samsung and IBM. Intel's mission is to form a US-based research consortium that is looking into ways to move to bigger, next generation wafers.[4] Going from 300mm to 450mm wafer, means increasing tremendously equipment size and cost, but it will allow building more chips per wafer at a lower cost. "Intel hopes the agreement will shorten the timeline to create bigger and more cost-efficient 450-millimeter (mm) wafers and a new generation of advanced extreme ultraviolet lithography."[5] For this reason Intel is already building its manufacturing factories now, including D1X in Hillsboro (an \$11 billion factory that was finished last year) where 450mm wafer technology will start, as well as 2 other new fabs, 1 in Arizona, and 1 in Israel.



**Figure 12: Intel's Future Factories** 

Intel has only just slipped the 22nm-sporting Ivy Bridge chips the summer of 2012, and it is already working with the next advancements in process technology. Besides the Ivy Bridge chips that were just released on the market and can barely keep up with the demand, Intel has teased a roadmap where they've shown 10nm, 7nm and 5nm processes already locked down **[6]**.



# Figure 13: Intel R&D Chips Pipeline

The way Intel is able to do this and continue to keep up with new innovation in such a rapid market is by having its factory ability and continuous upgrade. Intel is also preparing to upgrade fabrication plants in the United States and Ireland to make chips using the 14nm fab method. Intel's R&D is quite deep and looks decades in advance. If it all goes to plan, Intel would start shipping 10nm processors in 2015, with work on 7nm technology starting shortly after. In order to stay a few steps ahead of the competition, process technology is not the only key to the customer puzzle. Intel will also have to break into the mobile space with powerful, but energy-efficient chips.

# **Synopsis**

Dr. Alavi's presentation identified five main points related to the "Challenges in Managing Innovation." The first point depicts and addresses the related characteristics of innovator geniuses or idea generators, such as, being

creative, initiator, and discovers. Innovator geniuses are characterized by unusual personalities. It is also difficult to manage and motivate them. The second group provides guidelines for a leader who has to manage an innovator: clarity of mission and vision of an organization, the determination of people as a part of an organization with skill diversity, the preparation for unexpected situations, and the transformation of a company's culture and processes to understand individual differences and provide support. A creative environment is a critical factor that the company should consider in order to motivate workers and increase innovations within a company. The third point is the demonstration of how hard the evaluation for R&D workers can be. In general, R&D is not structured and creates a challenge when trying to evaluate innovators relative to their peers. The fourth point is about defining the differences between collectivism and individualism within a group, showing the opportunity of having more creativity within individualistic culture than a collectivism culture, and addressing the issues created in a matrix organization. Ultimately, the fifth topic describes the benefits of brainstorming, and suggests that a group of two is most effective. Cognitive inferences and team synergy was also discussed. The table summarizes the presentation, using the format for understanding other class case studies.

Scenario and Strategy Qualifiers	Description
What	<ul> <li>To prosper in current High-tech market, the idea of differentiation and effective innovation in products and services are ideal.</li> <li>Within companies appropriate management and leadership skills would effectively integrate the creativity and companies' business.</li> <li>Innovation requires special creative environment in order to develop creative geniuses within organizations.</li> <li>The defined characteristics of innovators are high aspiration, unique, and out of the box thinking</li> <li>The evaluations and rewards for an innovator require a specific approach due to complex details and activities.</li> </ul>
Who	<ul> <li>Innovators</li> <li>Project Leaders</li> <li>Gatekeepers</li> <li>Sponsors</li> </ul>
Why	<ul> <li>Generally, innovator geniuses or idea generators have unusual personalities. They are more likely to be creative, initiative, self-confidence, and independent, which differ from ordinary people. With those characteristics, they are difficult to manage and motivate.</li> <li>Innovators' working characteristics are described in five aspects below <ul> <li>Primarily focus on their professions rather than commit to their organizations.</li> <li>Promotion and salary are not so important, their desirability and new challenges are the drivers behind their success.</li> <li>Marketing is not their focused area, but technical enhancement is their interests.</li> <li>Deadlines are not a priority for innovators. Their time horizon is long.</li> <li>Flexibility, autonomy, and freedom are their concerns.</li> </ul> </li> <li>Management and leadership are the important factors that are classified into three main responsibilities: <ul> <li>The clear mission and vision should connect with individuals' professional sense of achievement - motivation and commitment would trigger creativity.</li> <li>The consideration about skill diversity together with prepare for unexpected issues are also appropriate – what should the organization look like?</li> <li>Create a culture that encourages and supports an innovator genius.</li> </ul> </li> <li>The friendly creative environment is another factor for innovators. Companies should provide the creative atmosphere. Characteristics of this environment include a flat organization, requiring less routine report, and enhancing delicate management. (Set the direction, monitor, and correct only when needed)</li> <li>The evaluation and reward for R&amp;D workers are considerably hard to evaluate because R&amp;D</li> </ul>

# **Dr. Hossein Alavi Presentation Summary**

	activities are less clear structured, integrated, and more complex.
	<ul> <li>activities are less clear structured, integrated, and more complex.</li> <li>Innovation team dynamics are categorized into two classes, which are <ul> <li><u>Collectivism</u> is the wisdom fundamental value for most firms by highlighting united interrelationship among teammates. Group's goal is to take priority over individual needs. Creativity in a collectivistic team is the development of new and innovative ideas.</li> <li><u>Individualism</u> is concerned with individual's needs under the condition of independence and his/her determination. Individualistic teams would prefer to new challenges and discoveries in order to boost creativity.</li> </ul> </li> <li>Individualistic groups having strong norms that generate creativity. But, many innovation firms with strong culture could also inspire creativity - 3M Corporation is an example.</li> <li>A matrix organization is the default structure for various technology driven companies. Sometimes, this kind of organization may trigger related troubles like the conflict of different personal aspects and project objectives. Ideally, retaining technical skill and productivity should be considered when the organizational structure is considered.</li> <li>Distraction, time competition, numerous task handling, and social anxiety are defined as cognitive interferences.</li> <li>Team synergy consists of multiple skilled members, utilizing the idea of incubation for better idea, paying attention to each other (small groups), and more productivity (large groups).</li> <li>Product champions or idea exploiters are the people who have both technical and marketing skills. They are risk takers and intelligent, but it is hard to find and recruit this kind of skill. Also, past performance does not guarantee future performance – it is risky to support geniuses.</li> <li>Project leaders or business innovators are the ones who provide support functions, which are planning, monitoring, controlling, and financial and material resources.</li> </ul>
How	<ul> <li>support, consultant, and encouragement to facilitate the activity of the group.</li> <li>The interaction among innovators needs occur to encourage team dynamics.</li> <li>Embrace differences and collective goals.</li> </ul>
	<ul> <li>Embrace differences and collective goals</li> <li>Keep refining and developing communication techniques between cross-functional, bottom up and top down.</li> <li>The selected projects should be clear and corresponded to market goals. Preparing plans is the key to control and develop particular projects.</li> <li>The larger group, the more inconsistency and less creativity. Teams with a couple of people are most effective.</li> <li>An effective interaction is not face-to-face meeting or conversation, but writing and virtual meeting discussion.</li> <li>Providing appropriate resources and adequate time to handle tasks is important for workers to successfully get the jobs done.</li> <li>In R&amp;D firms, project leaders should have in-depth comprehension in science and technology.</li> </ul>
	- A gatekeeper is the path of mitor mation now, which helps commutation to be more productively.

## **Analysis**

The team uses the content given by Dr. Alavi to demonstrate the connection between the presentation and how these concepts are practically applied at three companies. Since each team member worked at an organization that have innovators, tying the presentation material to a practical application seemed like a natural approach. The first company, Mondelēz International Inc., illustrates the company's motivational principles used to lead people. It is mainly about Conflict Mode Instrument (CMI), Personal Style Inventory (PSI), Change Style Indicator (CSI), and Situational Leadership (Diagnosing Development level), which provide the guidelines to be an effective leader, and therefore the ability to manage creative people. The second company is Bonneville Power Administration (BPA). The analysis describes characteristics of their creative geniuses, the difficulties managing and motivating them, and provides solutions to improve their current processes. Specifically, details are provided to support the four major aspects, which are genius characteristics, impact on culture, evaluation mechanisms, and managing team dynamics. The last company is Intel and the emphasis of the discussion is on how important it is to work in a team culture – innovators need to adapt. Elements of high performance teams are considered along with the adaptation of the Tuckman model (Intel's model of team development).

# Managing Innovation at Mondelez International

Mondelēz International, Inc. is an American multinational confectionery, food and beverage conglomerate, employing around 100,000 people around the world. It comprises the global snacking and food brands of the former Kraft Foods. The Mondelēz name came from the input of Kraft Foods employees at the time - Monde being French for world and lez meaning delicious.

At Mondelez we believe that effective leaders do not employ the same style of leadership to be effective. One leader is decisive. Another leader is more democratic. Both are effective. Some leaders do it all, while others don't seem to do anything at all. Both seem to get the job done.

There are three styles of leadership in general:

- Directive leaders are the center of decision-making and activity; the leaders serve as directors.
- Consulter leaders are the moderators while the group is the center of decision-making and activity.
- Delegating leaders serve as an information source while there are individuals at the center of decisionmaking and activity.

As a project leader, our primary goal at Mondelez is to become delegating leaders by developing and enhancing our team efficiency.

Mondelez has established a series of training and educating sessions to help its leaders to achieve their goals. During these training and mentoring sessions the leaders will learn about different personal styles and motivation skills knowing that one size doesn't fit all.

## Mondelez motivational principals and effective leadership styles

Motivation is the force that initiates, guides and maintains goal-oriented behaviors. It is a psychological feature that arouses an organism to act towards a desired goal and elicits, controls, and sustains certain goal directed behaviors. It can be considered a driving force; a psychological one that compels or reinforces an action toward a desired goal. For example, hunger is a motivation that elicits a desire to eat.

According to Herzberg's motivational theory, we all have basic needs, "hygiene needs", which, when not met, cause us to be dissatisfied. Meeting these needs does not make us satisfied; rather it merely prevents us from becoming dissatisfied

Hygiene factors surround the job and make up the environment in which employees work. Job security, work conditions, supervision, company policies are examples of hygiene factors. Unacceptable hygiene factors lead

to job dissatisfaction. Acceptable ones lead only to a neutral state of no dissatisfaction rather than increased satisfaction.

Our needs are shaped by our experiences over time. Most of these fall into three general categories of needs:

- > Achievement
  - Achievers seek to excel and appreciate frequent recognition of how well they are doing. They will
    avoid low risk activities that have no chance of gain. They also will avoid high risks where there is a
    significant chance of failure.
- ➤ Affiliation
  - *Affiliation seekers* look for harmonious relationships with other people. They tend to conform and shy away from standing out. They seek approval rather than recognition.
- > Power
  - *Power seekers* want power either to control other people (for their own goals) or to achieve higher goals (for the greater good). They seek neither recognition nor approval from others -- only agreement and compliance.

Effective Leadership is about one size does not fit all. There are four principals to consider when leading people. These four principals are:

- 1. Conflict Mode Instrument
- 2. Personal Style Inventory
- 3. Change Style Indicator: (CSI)
- 4. Situational Leadership (Diagnosing Development level)

We will briefly explain these principals in this paper.

# **1. Conflict Mode Instrument:** [12]

The Thomas-Kilmann Conflict Mode Instrument (TKI) assesses an individual's behavior in conflict situations. In conflict situations, we can describe a person's behavior along two basic dimensions:

- > Assertiveness: the extent to which the individual attempts to satisfy his or her own concerns
- Cooperativeness: the extent to which the individual attempts to satisfy the other person's concerns.

These two dimensions of behavior can be used to define five methods of dealing with conflict. These five conflict-handling methods are:

# Competing:

- Assertive and uncooperative
- Power oriented mode
- Pursue his or her own concern at the other person's expense
- Collaborating:

- Assertive and cooperative
- Attempt to find a solution that fully satisfies the concerns of both parties
- > Compromising:
  - Intermediate in both assertive and cooperative
  - Attempt to find an expedient or a mutually acceptable solution
- > Avoiding:
  - Unassertive and Uncooperative
  - Ignore the conflict
- Accommodative:
  - Unassertive and cooperative
  - The opposite of competing

## 2. Personal Style Inventory (PSI): [11]

Just as every person has feet and toes shaped differently than others, we also have differently shaped personalities. No one thinks the shape of a foot or toe is either right or wrong, or they either work well or they don't. The same thing can be said about differently shaped personality, they just work more or less differently depending on the situation and the task they are performing.

The Personal Style Inventory (PSI) has been developed to help people with some useful insights into their preference for using their mind. These preferences produce a personal style that characterizes people's most frequently used pattern of thinking and behavior.

The PSI measures people's relative preference in four pairs of traits that relate to perceiving (the types of information to which people pay attention) and judging (how they make decision). Differences in the way people prefer to perceive and make judgments about their perceptions lead to differences in behavior or personal style.

## Perceiving:

Perceiving refers to the way in which people become aware of things and ideas. There are two ways of perceiving:

- ➢ Sensing
  - Likes facts, details, data
  - Good to monitoring processes
  - Remembers the facts clearly
- ➢ Intuition,
  - Likes concepts, ideas and theories
  - Gets general impressions
  - Good at planning and innovation

In general perceivers:

- Consider all sides of an issue
- Delay making decisions
- Prefer top let things happen

# Judging:

Judging refers to the way in which people come to conclusions about what they have perceived. There are two ways of judging:

- > Thinking
  - Use rational thought
  - Is analytical and logical
  - Prefers rules, procedures and systems
- ➢ Feeling
  - Use personal reactions
  - Believes feelings are superior to logic
  - Impatient with analytical types

# In general judgers:

- Prefer deciding to perceiving
- Make quick decisions
- $\circ \quad \text{Move quickly from decision to action} \\$

In addition, people have preferences about where they choose to exercise their perception and judgment. There are two types of personality in the essence of preferred general orientation to the world:

- Extraverts: Outer-World oriented
  - Relates freely to others.
  - Shares thoughts and feelings easily
  - Tries to conforms to other's expectations
- Introverts: Inner-World oriented
  - Values personal inner world
  - Relates to others with caution
  - Maintains own direction n face of outside pressure
- 3. Change Style Indicator: (CSI) [13]

Change style indicator is an assessment instrument designed to measure people's preferred style in approaching change and dealing with situations involving change.

Change style ranges from a conserver style to an originator style. A third style, the Pragmatist, is in the middle of this range.

- ➤ Conservers:
  - Prefer change that maintain current structure
  - Enjoy predictability
  - May focus on details and the routines
  - Accept the structure and prefer change that is incremental
- > Pragmatists:
  - Agreeable and flexible
  - Appear more team oriented
  - Are more focused on result than structure
  - Explore change and prefer change that is functional
- > Originators:
  - Prefer change that challenges current structure
  - Will likely change accepted assumptions
  - May appear undisciplined and unconventional
  - Can treat accepted policies and procedures with little regard

Conservers see Originators as:

- Wanting change for the sake of change
- Lacking appreciation of tested ways of getting things done
- Not interested in follow through

Originators see Conservers as:

- Having their head in the sand
- Lacking new ideas
- Dogmatic

# 4. Situational Leadership (Diagnosing Development level): [10]

On top of the differences between people's personality and styles, another important principle is to understand people's development level in their job. These development levels can be characterized in four categories:

Development level (characteristics and descriptions):

D1: Enthusiastic beginners (Low competence, high commitment)

- New to the goal or task
- Eager to learn, excited and optimistic
- Don't know what they don't know

D2: Disillusioned leaners (Some competence, low commitment)

- Have some knowledge and skills,
- Frustrated and discouraged
- Unreliable and inconsistent

D3: Capable but cautious (Moderate competence, Variable commitment)

- Self-directed
- May be bored with goal of task

D4: Self-reliant achiever (High competence, high commitment)

- Recognized by others as expert
- Consistently competence
- Inspired and inspire others
- Proactive thinkers

## Situational Leadership: (developing flexibility)

Depending on people's development level the leaders must understand the best approach to keep their teams motivated and yet enhance their ability to get the job done more effectively. The four leadership styles for each of the four development levels are given below:

## S1: Directing

- Define goals and timelines
- Define roles, limits, priorities and responsibilities
- Develop a plan for learning and practicing new skills
- Check and monitor learning frequently

## S2: Coaching

- Involve individual in clarifying goals and plans
- Help individual analyze success and failure
- Explain why
- Provide information and resources to refine skills

S3: Supporting

- Encourage the individual to take the lead in goal setting
- Ask: "how can I help?"
- Reflect on the past success and skills to build confidence
- Suggest ways to make the goal more interesting

- Expect the individual to take charge and keep others informed
- Expect the individual to take the responsibility for goal setting
- Trust the individual's judgment
- Provide opportunities to share knowledge and skills
- Acknowledge, value and reward contributions
- Expect individual to evaluate own work and to continually innovate
- Encourage individuals to challenge themselves to even higher levels of performance

A major function of leaders is to support the motivation of other individuals and groups. (There is debate as to whether a person can motivate another versus whether a person can only support another to motivate themselves.) There are approaches to motivating people that are destructive, for example, fear and intimidation. While these approaches can seem very effective in promptly motivating people, the approaches are hurtful, and in addition, they usually only motivate for the short-term. There are also approaches that are constructive, for example, effective delegation and coaching. These constructive approaches can be very effective in motivating others and for long periods of time. Different people can have quite different motivators, for example, by more money, more recognition, time off from work, promotions, opportunities for learning, or opportunities for socializing and relationships. Therefore, when attempting to help motivate people, it's important to identify what motivates each of them. Ultimately, though, long-term motivation comes from people motivating themselves.

#### **Managing Innovation at BPA**

Utilities are not typically associated with innovation or research and development. In 2007, the NSF report shows that, on average, utilities spend 0.1% of revenue on R&D [9]. This amount pales in comparison to other industries like Apple and IBM, where R&D investments orders of magnitude more than a utility. As a result of utilities investing little on R&D, technology is typically antiquated. However, there are many reasons why utilities should be considering investment in R&D. These include smart/integrated grid technology, an aging infrastructure, and integration of renewable energy. In order to address these challenges, the industry needs to be armed with solutions.

The Bonneville Power Administration (BPA) recognizes that technology based solutions are required to address these challenges. As a result, the Agency has developed a systematic approach to deliver results. These solutions address the most pressing business challenges, to include renewable energy integration, integrating a "smarter" grid, and updating equipment to increase throughput without compromising reliability. Research and development activities are centralized under the Technology Innovation Office. The group is represented in the organization chart (figure 1). The office is managed by the Chief Technology Innovation Officer. Reporting directly to him are the Portfolio Manager, the Project Management Officer, and the Technology Transfer Manager. Each function is briefly described:

• Portfolio Manager: The position manages the proposal solicitation, portfolio selection, and orchestrates reviews with an Executive Council.

- Project Management Officer: Once the portfolio is selected, this position ensures that the project managers are equipped with the right tools to manage their project(s) effectively.
- Technology Transfer Manager: The ultimate goal with R&D is to transfer the technology to application. This position is responsible for implementing a technology transfer framework that ensures application of R&D efforts.

Chief TI OfficerRoadmapping<br/>SpecialistPortfolio<br/>ManagerProject<br/>Management<br/>Officer (PMO)Technology<br/>Transfer<br/>Manager

Underlying these functions are technology roadmaps that serve as the basis for the portfolio solicitation.

## Figure1

As described in Dr. Alavi's presentation, BPA is not exclusive in issues faced with managing innovation. There are the unique personalities to deal with, the impact on the organization to consider, and how to engage and retain creative genius – without which the organization may not be as advanced. Topics considered in Dr. Alavi's presentation will be discussed, relative to how they are addressed at BPA.

## **GENIUS CHARACTERISTICS**

Unique, "odd man out", flexible, autonomous, and creative are words typically associated with a genius. In addition, they are characterized by out-of-the-box thinking, less deadline oriented, and motivated by enhancing their status (versus monetary awards). Considering these definitions, there are a handful of TI project managers that could be considered as a genius.

Project managers have "dotted-line" reporting to the TI PMO. Translated, this means that the TI office has no direct responsibility over establishing their priorities. Also, the philosophy is to find project managers in the area most likely to apply the research results. Often times this results in having a technical expert (e.g. the genius) managing the project. The combination of no direct reporting and having a technical expert managing a project creates a challenge – the genius is used to freedom, non-conformity, and being less deadline oriented. This creates a challenge when project status reports, financial information, or other project related documentation is required. These tasks are seen as a "necessary evil" rather than enhancing project performance and adherence to project management best practices. In general, 25% of the TI project managers could be considered as a genius, based on the definitions provided by Dr. Alavi.

## **IMPACT ON CULTURE**

There are a few concerns associated with genius and the impact on the corporate culture. As mentioned during the presentation, these could include creating an environment that complies with the whims of the genius,

different managing styles are recommended, and determining the right "mix" of technical experts (e.g. creating bench depth). Certainly managing genius differently than other/mainstream employees has the potential for conflict. At BPA there is no evidence to support feelings of animosity among the Agency. Genius' are encouraged to pursue their interests and are recognized for their contributions.

#### **EVALUATION MECHANISMS**

While never documented, Dr. Alavi suggested that geniuses are typically given different treatment or evaluation criteria than other "non-genius" employees – the same rules are not universally applied to all technical employees. As well, he suggested a "dual-track" path for opening up promotion opportunities to a genius.

I am not a manager so with regard to the evaluation policies, I cannot speculate on how geniuses are evaluated. However, generally speaking, genius are given a wide berth related to their projects, with the qualification that their work always has to tie back into the agency objectives.

Dual-track career paths are available at BPA. Similar to national lab and industry practices of naming "Fellows" to distinguish the top technical performers, BPA has a "technical 15". Referring to the geniuses mentioned under the characteristics section, the 25% of TI project managers that could be considered as a genius, these people are "technical-15's". Does this distinction work, in terms of keeping them happy? One indication might be their length of service at the agency – each has been at BPA in excess of 15 years. If longevity is a sign of job satisfaction, then these genius are satisfied.

#### **MANAGING TEAM DYNAMICS**

Of the topics Dr. Alavi mentioned, the category of managing team dynamics presents the biggest challenge for BPA. Specifically, he mentioned that there could be conflicting priorities which would disrupt the team dynamic. Definitely this is the case at BPA. The project managers struggle with prioritizing operational problems and research and development projects. Often times, and for obvious reasons, the operational problems win! It makes sense – the Pacific Northwest relies on electricity. However, the value of research and development to solve long term problems cannot be underestimated. The solutions discovered today may prevent operational problems in the future. It is important to mention that the TI project managers are typically the technical experts in the area that is most likely to apply the research results. As Dr. Alavi pointed out these technical people typically don't like to be burdened with the mundane as often the case with project management. In an effort to resolve this conflict the TI office is cultivating project managers with direct line reporting to the office and who engage the subjectmatter-experts in the appropriate business line. This model allows the genius to continue doing what they do best – solve technically complex problems without the necessary overhead typically associated with project management. The effectiveness has yet to be realized – the model has only been in place for 1 year.

## **Managing Innovation at Intel - Manufacturing**

Even if you are the "innovative genius" as Dr. Alavi explained, if you work for Intel or in most organizations; you have to learn how to work in teams. In Intel's culture, there is a lot of time spend on teaching employees how to work in teams effectively. Even textbooks say that, "It is nearly impossible to think of working in an organization without being part of a team. Teams and teamwork are the building blocks of organizations." [7] Below is Intel's model of team development. It includes Tuckman but focuses on other components too. It covers all of the components for building, developing and maintaining high performing teams into categories.

The main focus for forming is Goals & foundations The main focus for storming is Roles & responsibilities The main focus for norming is procedures and processes The main focus for performance is synergy between the four elements



# Figure 1. Intel's version of the Tuckman model [8]

Forming TASKS: •	Establishing base level expectations Identifying similarities Agreeing on common goals	Storming TASKS:	Identifying power and control issues Gaining skills in communication Identifying resources
Performin TASKS:	ng Members agree about roles and processes for problem solving	Norming TASKS:	Achieve effective and satisfying results Members find solutions to problems using appropriate controls

Intel in teaching employees how to work in teams really focuses on team goals and foundations as well as roles & responsibilities of team members. A table of a team process is described below.

Team	٠	Have good working relationships
goals/foundations	•	Be open and informal
(What will we	•	Role-model operational excellence

accomplish as a team?)	<ul> <li>Be a high-performance team dedicated to the job</li> <li>Support the organization's production goals with equipment and readiness</li> <li>Improve productivity and results</li> </ul>
Roles & Responsibilities of Team Members (What is expected of each team member in contributing to the work of the team?)	<ul> <li>Finish deliverables on time and to quality standards</li> <li>Report and escalate problems</li> <li>Do individual planning to be more productive</li> <li>Clarify goals and expectations openly</li> <li>Resolve conflicts in a timely and constructive way</li> <li>Be enthusiastic about roles and raise performance levels</li> <li>Contribute ideas, designs, improvements, and plans for objectives</li> <li>Develop improvement plan for products</li> </ul>
Team ground rules, processes & procedures (What rules will we follow in working together as a team?)	<ul> <li>Attend every meeting</li> <li>Practice confidentiality</li> <li>Be an active participant &amp; member</li> <li>Show discipline in work: work done on time and to spec</li> <li>Show commitment to team goals: practice disagree and commit</li> <li>Give and receive feedback</li> <li>Present factual data</li> </ul>
<b>Decision Making</b> (How will the group make decisions?)	<ul> <li>Use consultative process as a general rule, consensus when necessary; make sure to consult all necessary stakeholders</li> <li>Make decisions based on data; collect data in a regular phase</li> <li>Know potential roadblocks that may hinder job</li> </ul>

## Summary

This report used a case study approach to analyze Dr. Alavi's characteristics of a genius as well as the difficulties with managing this group. Three very different organizations were considered: high-tech manufacturing, food industry, and government utilities. While the organizations have very different vision and mission statements and end products, there is a common theme – they **ALL** face the challenges and can identify with the characteristics of a genius. Intel and Mondelez have programs in place to understand team dynamics and therefore prepare their cultures for handling all types of people, genius included. BPA has implemented a process to help manage priority conflicts by using dedicated project managers, bringing in the technical experts (a.k.a. geniuses) as needed. All of the companies embrace the genius and acknowledge their contributions as significant to successfully meet objectives. Without their creative innovation the general consensus is that the advances realized in individual organizations would not have been possible without their insight. Geniuses are a necessary part of the corporate culture and creating an environment where they can thrive should ultimately be a goal of the organization.

# References

[1]Matt Knatz, Usa Today, "Microsoft, Google, Intel outspend Apple on R&D", [Online] <u>http://www.usatoday.com/money/perfi/columnist/krantz/story/2012-03-20/apple-marketing--research-and-development-spending/53673126/1</u>, March 2012
[2] Intel Labs, "Enabling a Digital Europe", [Online] <u>http://www.intel.eu/content/www/eu/en/research/intel-labs/enabling-digital-europe.html</u>, 2012

[3] Intel Corporation, "Intel unveils quad-core Ivy Bridge chips", [Online] <u>www.circuit.com</u>, 2012, [July 6, 2012]

[4] Intel Corporation, "Will Intel continue manufacturing in the U.S? [Online] <u>www.circuit.com</u>, 2012, [July 6, 2012]

[5] Intel Corporation, "Keeping Moore's Law alive and kicking", [Online] <u>www.circuit.com</u> [July 17, 2012]

[6]Anthony Garreffa, "Intel's R&D teases 10nm chips by 2015, already hard at work on 14nm", [Online] http://www.tweaktown.com/news/24093/intel\_s\_r\_d\_teases\_10nm\_chips\_by\_2015\_already\_hard\_at\_work\_on\_14nm/index.html

[7] Thompson, L. Leigh, "Organizational Behavior Today", New Jersey, 2008, p. 154.

[8] Marieb, Thomas (Intel instructor), "New to Managing Teams" (Intel's course), 2012.

[9] National Science Board 2010, Science and Engineering Indicators 2010, Available: <u>http://www.nsf.gov/statistics/seind10/c4/c4s3.htm</u> data in Appendix table 4 – 14

[10] Situational Leadership, Ken Blanchard Co, 2001

[11] Personal Style Inventory, David W. Champagne, R Craig Hogan, Third Edition

[12] Thomas- Kilmann Conflict Mode Instrument, Kenneth W. Thomas, Ralph H. Kilmann

[13] Change Style Indicator, W. Christopher, Robyn P. Ingram