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Crowd deliberations as an organizational tool for ideation and problem solving in manufacturing and development

Abstract

This study describes an effort to meaningfully engage employees of a global high-tech organization in an online crowd discussion aimed at identifying a preferable future workplace in manufacturing and development. 145 employees from various business departments at Intel Israel were chosen to take part in this crowd deliberation. The selection criteria of the participants were aimed at creating a sample of employees from the different groups that comprise the organization. The deliberations were conducted online based on a variation of the classic Delphi method called the Real-Time-Imen-Delphi (RTID) procedure, which was designed to engage a group of stakeholders in studying relevant trends, debating their implications and complex challenges, generating future images, and establishing a common ground on which they could devise a preferable agreed-upon future. Through the four stages of online deliberations required by the RTID procedure, the participants were able to draft a preferred vision with which Intel could focus on enhancing work effectiveness now and into the future by moving towards a fractal-based human network in the workplace, as opposed to the current hierarchical human-based connections.

Key words: Future workspace; Intel; Delphi; crowd deliberations; fractal networks.

Introduction

Business organizations are investing considerable efforts in attempting to identify major trends relevant to their markets. In the rapidly changing world, it is essential to acquire good abilities to agree on a preferable future and to act according to themⁱ. Most organizations leave innovation and ideas for good management to managers or to a limited number of experts (such as strategic planners who specialize in forecasting and market trend assessmentsⁱⁱ). The rise of online mass communication, along with social media growth and crowd wisdomⁱⁱⁱ that are practiced on a daily basis are opening new possibilities to organizations in the realm of decision making and futures methodologies^{iv}.

The current study describes an effort to meaningfully engage employees of a global high-tech organization in an online crowd deliberation aimed at identifying their preferable future workplace. The case-study presented here represents an example of how organizations can harness their employees' wisdom as part of a future-oriented ideation process. Such a process has the potential to influence the future of both the company and its employees.

Studying the workplace of the future

The following excerpts, cited from Intel's formal whitepaper on the future of work^v, pointedly describe why organizations should invest in contemplating what the future of work will look like: "People working in 2025 may view today's work environment as we now perceive the office life of the 1800s. Technology will be a major force of change, but the agents of change will be the innovative knowledge workers, who will envision, articulate, and implement the technology. Those companies that will possess a clear vision for the unfolding trends in the workplace have an unprecedented opportunity to excel in a dramatically different landscape."

This notion is reflected in a variety of questions that are being addressed by researchers worldwide. Some investigate what will be the physical work environment, or how people will communicate with each other and how this will influence their work^{vi}. Others investigate the types of activities that will be part of a typical workday and explore which technologies have the potential to introduce dramatic shifts in productivity and manufacturing processes^{vii}.

For example, Meister and Willyerd^{viii} described the workplace of 2020 as a “whole new game.” They specify demographic shifts in which the workforce is aging and changing its composition in terms of five generations who will cooperate together in the same workplace. They also envision a shift from workers who perform tactical tasks to knowledge workers who perform tasks that involve decision making, judgment, and analysis. On the technological side, they believe that progress is expected to lead to the creation of a digital workplace that will enable work from anywhere and at any time.

Other scholars have envisioned new employment models that will likely emerge. One example is the rise of the *supertemps*^{ix}. These will probably be top skilled professionals who have been trained in top schools and companies, who will be pursuing project- based careers, independent of any major firm. These *supertemps* will perform critical mission work of the type once accomplished only by permanent employees.

Alongside studies that envision the nature of the future workspace, there has arisen a genuine business need to prepare for the future from a practical perspective. Large organizations and even countries are also attempting to create their own strategy for their future workplaces. For example, in a public report titled: Israel 2028^x, a large committee of experts was called upon to envision economic and labor forces that will play a significant role in the workplace of the future.

For-profit organizations are engaging in similar attempts. PriceWaterhouseCoopers have initiated a survey of some 3000 new graduates from the US, China, and the UK who represent the millennial generation just joining the workforce, to test their views and expectations about the future of work^{xi}. Similarly, Greenhalgh & Moir^{xii} interviewed senior leaders from businesses, academic and government sectors, and based on scenario planning methodologies created scenarios and strategies for the future of the workplace in Canada.

These studies and similar ones used methodologies based on experts' surveys and analyses. Our study used a different approach and methodology to investigate these same questions. We aimed at tapping into the wisdom of crowds as a constructed tool in order to determine Intel employees' preferred work environment of the future.

Brabham^{xiii} was one of the first to refer to the wisdom of crowds and its benefits in manufacturing and development settings, defining it as an online, distributed problem solving and production model. In the workplace, crowdsourcing, as some call it, can manifest itself in the form of a wide number of employees performing a task (in our case envisioning the future of work), which could alternatively be performed by an assigned group of employees (in our case, strategic analysts). This fairly new form of multi-directional communication allows organizations to engage employees as partners by offering them the opportunity to actively participate in the process of ideation and/or decision making. Fortunately, current technology makes it easier than it was just a few years ago to conduct deliberations with large-scale groups^{xiv} and enables these ad-hoc online communities to serve as venues where people come together to generate new ideas for manufacturing processes.

Methodology

In order to tap into the wisdom of the employees who participated in this study, we applied a procedure that was found to be effective in cultivating the wisdom of crowds and specifically in envisioning collective preferable futures. The procedure is called the Imen-Delphi (ID) technique^{xv}, and it is basically a variation of the classical Delphi forecasting technique^{xvi}. The Imen-Delphi (ID) procedure was designed in order to facilitate discussion among a group of panelists who share a common future interest. The goal of the procedure is to help the participants clarify their opinions and expectations regarding their preferable and possible futures and thus to help them commit themselves to the task of implementing the desirable, agreed-upon future^{xvii}.

This procedure, dubbed Real-Time-Imen-Delphi (RTID), was further developed to take advantage of the powerful online technological platforms that were emerging at the beginning of the century and became a real-time variant to the original procedure^{xviii}. It aimed at adding a collaborative online deliberation aspect to the Imen-Delphi procedure to be used by groups in order to create together a desired future, by engaging them in online systemic and organized discussions debating and reaching a consensus about a future-oriented subject. The RTID was found, in a variety of studies involving different groups debating a wide array of topics, to be adequate in terms of enabling effective learning, dealing with complex challenges, forming new images of the future, finding common ground, and setting the task of working together to achieve a common and agreed-upon future mission^{xix}.

The current study applied the Real-Time-Imen-Delphi technique as an electronic procedure for accessing the wisdom of the crowd of a group of employees at Intel Israel to envision their preferred future work environment characteristics in development and manufacturing processes. This is the first application of the RTID that has involved hundreds of participants using a dedicated online platform able to accommodate thousands of participants in real-time structured deliberations. All

other applications of the RTID to date have been conducted via regular platforms such as emails, bulletin boards and forums.

Participants

A group of 145 high-tech employees took part in this structured crowd wisdom RTID procedure. The 145 participants were gathered from the different branches, units, and departments of the organization. They held a variety of roles within the organization, and came from different demographic backgrounds (Table 1). These units included the HR Department, The R&D Department, the various manufacturing branches, the Corporate Services Department (responsible for the physical layout of all offices and facilities), the IT Department, the Sales & Marketing Department, and the Legal Department.

Branch	N	Males	Females	Age
Research & Development	69	50	19	34.6
Manufacturing	40	27	13	36.1
Human Resources	23	4	19	35.5
Corporate Services	6	4	2	37.3
Information Technology	5	4	1	34.9
Sales & Marketing	1	1	-	30.5
Legal	1	-	1	48.1
Total	145	90	55	35.3

Table 1. Demographics of the participants

The participants were identified and approached based on an assessment of their interest in the topic and potential contribution to the process. The occupations of the participants reflected the variety of roles and careers that exist in the organization. Among them were hardware engineers, software engineers, programmers, product engineers, product development engineers, component design engineers, equipment engineers, CAD engineers, automation engineers, industrial engineers, manufacturing technicians, manufacturing managers, strategic planners, planning analysts, IT managers, product/service line managers, project managers, HR business partners, training

specialists, training managers, compensations and benefits managers, internal communication specialists, internal communication managers, recruiters, marketing specialists, and lawyers.

The participants were chosen based on the following list of criteria formulated by a steering committee appointed for this purpose by the head of the HR department: age, seniority in the organization, managerial experience, role and position, and geographical location. The selection criteria were aimed at creating a representative sample of employees, in terms of the different groups that comprise the organization. The list of participants was not intended to statistically represent the population of the organization (for example, the proportion of young employees was higher among the participants than in the organization in general). It is important to note that during the deliberations, participants' anonymity was maintained, so that each participant's specific contribution remained undisclosed. All participants gave their initial consent to take part in the study beyond their ongoing professional obligations.

Procedure

The Real-Time-Imen-Delphi (RTID), like the original Delphi, consists of four iterations, all of which were facilitated in this study by the researchers. The four iterations are: 1. question formulation, 2. suggested mission statement composition, 3. mission statement evaluation (rating), and 4. proposal of implementable ideas. Before implementing these four stages, there is a preliminary phase during which participants are exposed to background materials aimed at triggering the question formulation phase.

The initial learning phase

Before initiating the actual discussion, we provided the participants with thought-provoking intellectual teasers. These were meant to introduce the participants to projections of the workforce as described by a variety of scholars and studies. This learning phase aimed to enhance the

participants' ability to generate thoughtful questions about the future of their workspace. The teasers were introduced through the online special platform that was designed for this study in a variety of formats (e.g. texts, graphs, video clips). They provided summaries of various types of information (e.g. previous forecasts, studies, white papers, position papers, trends analysis, etc.) and were divided into thematic categories for ease of consumption (Figure 1).

Workforce of One

Tags: [Organizational processes](#)

תגיות: תהליכים ארגוניים

As the workforce becomes more diverse (in terms of age, gender and ethnicity), one-size-fits-all employment offers, career paths, and benefits are becoming a thing of the past. Companies have already realized the numerous benefits of providing their customers with tailor-made services/products. However, recent studies have shown that the same approach also applies to employees (aka, "workforce of one"). Work that is sculpted to fit lives (instead of lives that are sculpted to fit work) results in lower employee turnover, greater productivity, and improved profit margins.

Related to this thought is the point of benefits, which ultimately, where workforces of one are concerned, may shift toward more personalized benefit structures, with more workers able to select benefits that fit their circumstances with corresponding adjustments in cash compensation.

Meister J.C and Willyerd J. (2010), The 2020 Workplace.
 Karoly L.A. (2004), The 21st Century at Work.
 Smith D. & Cantrell S.M. (2011), The new rules of engagement: treating your workforce as a workforce of one, Strategic HR Review, Vol. 10 Iss: 3, pp.5 – 11

More links: קישורים נוספים:
[Workforce of One \(Clip\)](#)
[Workforce of One \(Slideshow\)](#)

2 Links לינקים

Figure 1. A sample of a teaser regarding future trends in the work place

First iteration: Question formulation

The purpose of the first iteration, in which the participants were asked to formulate questions, was to collectively develop a database of sophisticated questions, queries, concerns, and perplexities that would be able to compel the participants to engage in deep discussions, through which they would, it was hoped, express their collective inner preferable images about the future. Participants were instructed to articulate as many questions as possible, while refraining from engaging in discussion about potential answers. The questioning stage aimed at challenging the participants and increasing

their motivation and expectations to engage in the deliberations that would follow. At this stage, the participants were able to generate 689 questions which we had to consolidate. After a lengthy period of deliberation, the steering committee was able to formulate, out of the initial 689 questions, 90 well-organized questions that were introduced to the participants in the second iteration for deliberation, eliminating repetitions and consolidating the scope of issues that emerged from the queries and concerns (Figure 2).

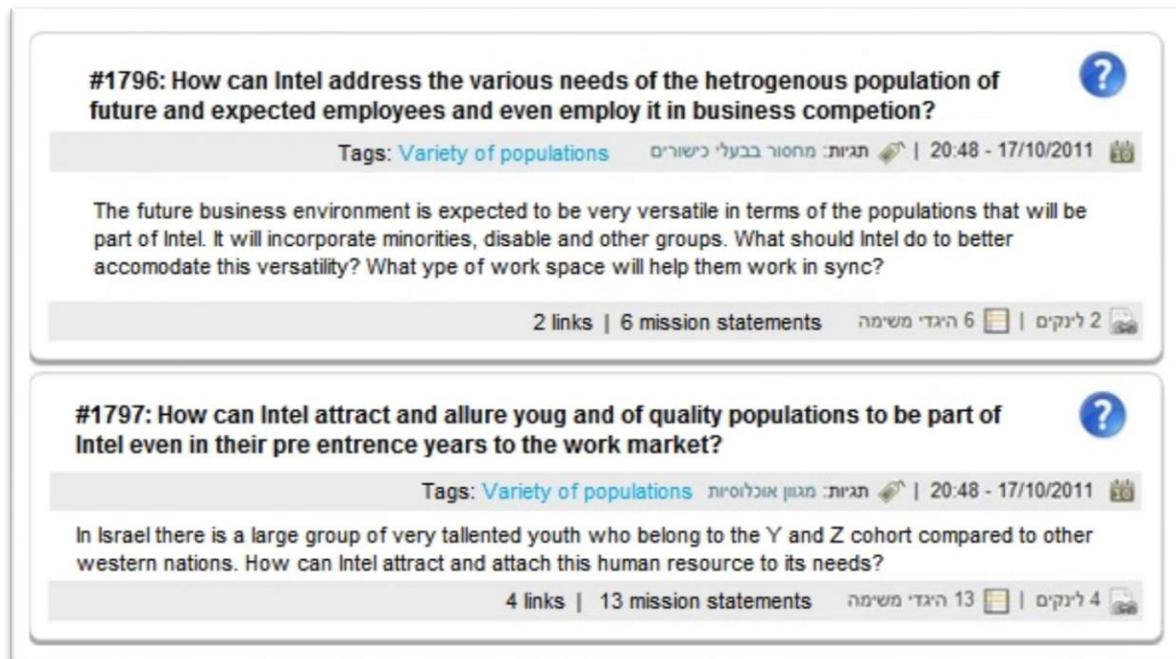


Figure 2. A sample of questions generated at the first iteration of the RTID that moved to the second iteration

Second iteration: Mission statement composition

The purpose of the second iteration was to facilitate open and structured deliberations among the participants. It aimed to generate particular ideas and statements that the group or the organization could, in turn, implement in order to promote the workplace of the future. During this stage, participants were asked to answer the questions briefly, in the form of a mission statement (e.g.: *The organization ought to*; *The company needs to*). In addition, participants were instructed to comment

on their colleagues' suggested mission statements, and define their comment as *pro*, *con*, or *neutral*. The underlying purpose of the comments was to reach the best possible mission statements, those that would reflect the aspirations of the entire group for the future of their workspace (Figure 3).

The screenshot displays a web-based interface for a crowd deliberation. At the top, a lightbulb icon is next to the title: "#2722: Intel should implement a culture that enables work-life effectiveness to retain its employees for the long term". Below the title are navigation links: "word", "register", "next", and "back". On the right, it says "Participant # 192". A grey bar contains the tags: "Intel culture" and "תגיות: תרבות אינטל", along with a timestamp "11:57 - 22/12/2011".

The main text of the mission statement reads: "The technology that facilitates work anywhere/anytime and the global needs to work in times that were supposed to be for family life, are taking a high toll on personal life. it is a burden that impossible to tolerate in the long run. The employee needs to pay attention to its toll and alarm the employer when the balance is off. The organization needs to legitimize the reporting of such imbalances, listen and address these concerns."

Below the mission statement is a section titled "Linked materials" containing a question: "Q # 2133: In times of qlobal access anytime/anywhere, how can an organization develop a culture that separates work from home and personal life?". There are two links: "Delete question" and "Add an applicabale idea".

The "Deliberations" section shows three comments in Hebrew, each with a header bar containing icons for "reply", "vote", "delete", and "delete".

- Comment 1: "שלח ע"מ משתתף 495 ביום ש, 14/01/2012 - 23:42. (בעד) היגד אדיר! בהרצאה של פסיג הוא דיבר על החירות - הנה דוגמא מצוינת - ברגע שיהיו כללים ברורים של מה היא הפרת החירות תהיה רבה יותר, היום כשיש אפשרות לעבוד מכל מקום התפחתה ציפיה שנעבוד מכל מקום ותמיד ולא מכל מקום במגבלות זום עבודה נורמלי. כבר היום ישנם מהנדסים שלא מוכנים לעבוד באינטל לא בשל היותה ארגון לא מאתגר טכנולוגית אלא בשל התנאים של איזון בית עבודה"
- Comment 2: "שלח ע"מ משתתף 481 ביום ה', 05/01/2012 - 21:16. (בעד) היגד מאוד חשוב, בייחוד היום. עובדים שלא יכלו ליצור את האיזון, ישחקו לאורך זמן ולבסוף יעזבו או שביצועיהם יהיו פחות טובים."
- Comment 3: "שלח ע"מ משתתף 405 ביום ג', 03/01/2012 - 13:00. (בעד) תברה המסייעת לאיזון בית עבודה משמרת את עובדיה לטווח ארוך."

Figure 3. An example of a suggested mission statement and the deliberations that followed it

Third iteration: Mission statement evaluation (rating)

The rating process of the mission statements, in the third iteration, was meant to provide the participants with a way to promote the ideas they supported. The rating process enabled them to

focus the deliberations around what the group regarded as the most important, most expected, and most preferred futures for the workplace. They were asked to rate the statements according to three criteria: their *importance*, *priority*, and *likelihood of implementation*. As in the second iteration, during the rating stage participants were offered the possibility to submit comments in order to explain their rating and engage in any kind of persuasion they found necessary to support their or their friends' suggested mission statements. It is important to note that participants were allowed to change their rating throughout this stage, based on the ongoing discussions (Figure 4).

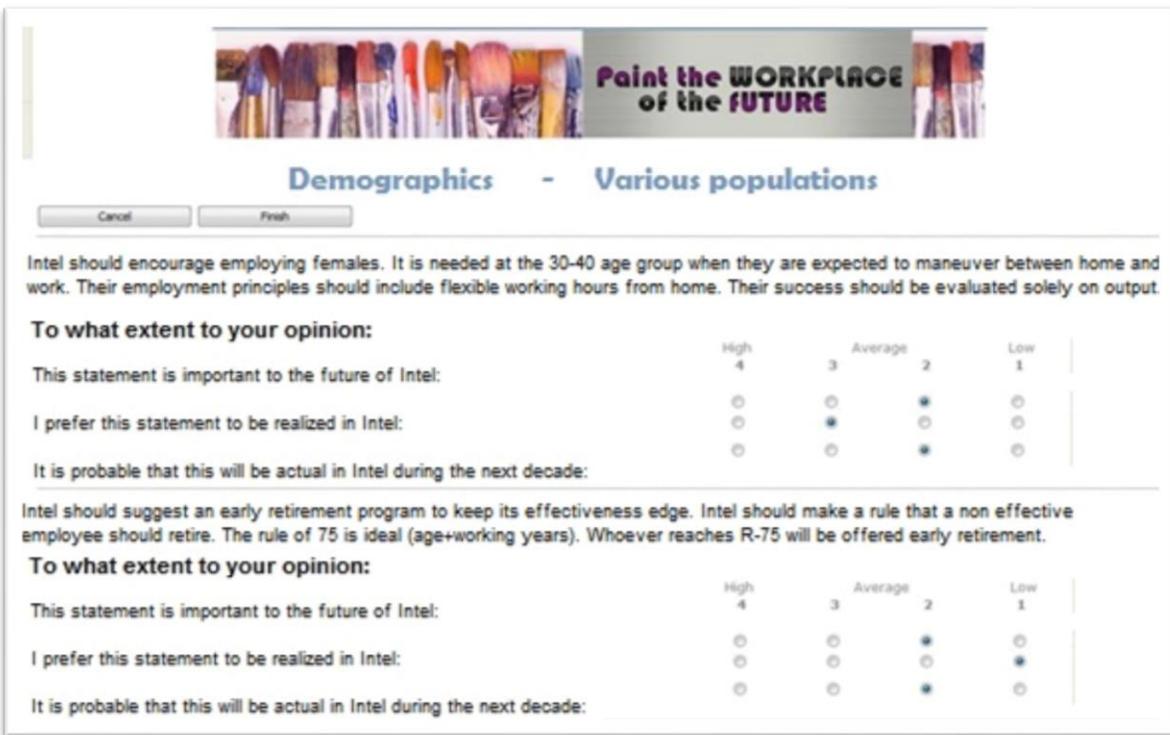


Figure 4. A sample of the rating interface employed in the third iteration

Fourth iteration: generating implantable ideas

At the end of the rating stage, we compiled a short list of top-rated suggested mission statements, based on percentage of proponents. From this list we then extracted the underlying assumption, aspiration, and preferable vision that this crowd was able to generate. In the following chapter we

discuss the results of each iteration and explain how the RTID procedure helped us understand the participants' preferred future of their workspace.

Results

First iteration

The first iteration, which took place over the course of three weeks, enabled the participants to produce 689 initial questions, as noted above. The participants were required to assign each question to one of five categories (reflecting the categories to which the background learning materials were assigned): *demographics*, *technology*, *work environment*, *organizational procedures*, *culture & values* and *other* (Table 2).

Category	Number of questions raised by participants
Demographics	58
Technology	110
Work Environment	190
Organizational Procedures	189
Culture & Values	100
Other	42
Total	689

Table 2. The 689 initial questions by category

Prior to launching the second iteration, we consolidated out of the initial batch of 689 questions a short list of 90 questions, by clarifying and combining the most relevant questions raised by the participants. In addition, in order to enable easier navigation and clarity in the subsequent stages of deliberations, we broke down the five categories further into sub-categories (Table 3).

Category	Sub-category	# of questions
Demographics	Globalization	4
	Israeli environment	3
	Knowledge and skills	2
	Diversity	5

	Shortage of skills	4
	Total	18
Technology	Consumerization	1
	Green technology	1
	technology Communication	1
	Communication trends	5
	Computing environment	3
	Virtual work	1
	Total	12
Work Environment	Safety and privacy	4
	Organizational workspace	6
	Virtual work environment	3
	Physical work environment	4
	Total	17
Organizational Procedures	Hiring and development retention	8
	Training and communication	3
	Measurement and evaluation	2
	Employment frameworks	3
	Collaboration	3
	Innovation	5
	Total	24
Culture & Values	Social responsibility	3
	Globalization	2
	Employee/er relationships	4
	Organizational environment	5
	Collaboration	2
	Organizational culture	3
	Total	19

Table 3. The 90 questions by sub-category

Second iteration

In the second iteration, which took place over the course of six weeks, the participants were able to produce 624 mission statements and 869 comments. As in the initial stage of question formulation, the participants were asked to assign each statement to one of the five categories (Table 4).

Category	Number of statements raised by participants
Demographics	92
Technology	66
Work Environment	152
Organizational Procedures	218
Culture & Values	85
Other	11
Total	624

Table 4: Suggested mission statements by category

In the second iteration, too, prior to launching the third iteration, we produced a short list of 258 suggested mission statements, by clarifying and combining the most relevant statements raised by the participants. Here too, we assigned each mission statement to one of the above five categories (Table 5).

Category	Sub-category	# of statements
Demographics	Diversity	22
	Lack of skills	8
	Globalization	7
	Knowledge and skill sets	4
	Israeli environment	2
Total		43
Technology	Technological trends	19
	Computing	13
	trends Market	10
Total		42
Work Environment	Organizational workspace	18
	Space, security, and privacy	11
	Physical work environment	7
	Virtual work environment	7
Total		43

Organizational Procedures	Hiring, training and retention	41
	Innovation	12
	Measurement and evaluation	12
	Collaboration	10
	Training and communication	9
	Work models	8
Total		92
Culture & Values	Social responsibility	15
	Intel culture	13
	New values	5
	Branding and marketing	4
	Organizational culture	1
Total		38

Table 5. The 258 mission statements by sub-category

Third iteration

In the third iteration, which took place over the course of just three weeks, the participants were able to produce 5,650 ratings and 881 comments. The participants were asked to rank each statement on a scale of 4 levels (from *low* to *high* – Figure 4) in terms of three aspects: How *important* and *preferred* the statement is for the organization; what the *priority* level for implementing the statement in the organization is; and the *likelihood* that the statement will be implemented, according to their best estimate and during the next decade. The following statements (Table 6) were the top ten statements that received the highest scores as the most important and preferred for the future workplace in Intel.

Statement	Importance/Preference to the Organization	Priority of Implementation	Likelihood of implementation
Intel should brand itself as a company that takes care of its employees in the best manner possible in order to attract new employees and retain the current ones.	3.72	3.65	3.54
Intel should brand itself as a leading company in technology and as operating in new and attractive market segments in order to attract new talent.	3.59	3.48	3.22
Intel should implement a culture that enables work-life effectiveness to retain its	3.53	3.72	2.99

employees for the long term.			
Intel should brand itself as a company that allows mobility across and between posts and fields in order to attract employees who are interested in diverse careers.	3.49	3.54	3.07
Intel should promote managers with high levels of emotional intelligence, and not only technical capabilities. This will increase employees' motivation.	3.47	3.60	2.78
Intel should reward innovative and creative employees by providing them with special bonuses or research budgets to encourage innovation and creativity.	3.44	3.39	3.01
Intel should offer its employees maximal flexibility in hours and amount of work in order to enable normal family life.	3.38	3.39	2.77
Intel should equip employees with its latest pilot products under development in order to advance its workspace, which can also act as a marketing strategy for families and friends.	3.36	3.48	3.05
Intel Israel should retain and develop the unique attributes of its site in order to create an advantage as compared to other sites around the world.	3.34	3.28	3.10
Intel should hire employees who specialize in customers and user experience in order to create attractive products.	3.33	3.21	2.91

Table 6: Top ten most preferred/important mission statements

At the end of this iteration, we produced a final list of 114 mission statements that clearly indicated that the majority (50% and more) of the participants would like to see as the leading, important, and most preferred future mission statements for their organization. The final statements were organized under themes (Table 7) to better clarify the concepts that underlie them.

Theme	Number of statements raised by participants as most preferred
Innovation and creativity	22
Computers and systems	16
Corporate social responsibility	15
Diversity	15
Employee development	13
Talent acquisition	12
Employee involvement	11
Management and leadership	10

Total 114

Table 7. The final list of mission statements by theme

This list was then presented to the participants, who were asked to generate implementable ideas that are practical ways for promoting the agreed-upon statements and visions (Table 8).

Innovation and creativity	hold creativity and innovation courses; implement crowd discussion and have employees participate in innovation and future planning; provide employees with time to work on personal projects/innovations; allow employees to list patents on their names; reward employees for innovation; collaborate with the academy.
Computers and systems	Increase usage of cloud services with access from cellular phone to work data; Implement systems supporting virtual work for individuals and teams from anywhere, at any time; knowledge-sharing applications; provide employees with the latest technology computers and cell phones.
Corporate & social responsibility	Clean energy and recycling; open “green” jobs/roles for employees; Allow work-life balance and flexible employment models; put focus on ergonomics for shift workers; use robots for hazardous work; maintain relations with employees’ families, apply ethics codes not only on company employees, but on vendors and services providers as well.
Diversity	Hire multidisciplinary employees (who have knowledge and experience in several fields), put focus on diversity (hiring and developing): gender, maturity, and ethnicity.
Talent Acquisition	Put focus on flexible work models for diverse populations, encourage multi-generations at work (including youth and 50+ employees); employ “job sharing” to deal with: time zone differences, knowledge and skill gaps; allow part-time work models.
Development	Identify pivotal talent and develop it, enrich current positions, reward managers for employee development, encourage academic studies, develop different kinds of developments paths.
Employee involvement	Create systems and platforms that encourage knowledge sharing and communication; involve employees in pilots of Intel products; encourage employees’ ideation; encourage speed in decision making and involve employees in decision-making processes.
Management and leadership	Virtual management – manage from afar; increase employee access to leaders; conduct surveys to get employee feedback on managers and leaders.

Table 8. A sample of implementable ideas

Fourth iteration

Next, we engaged in making sense of the whole. Following long deliberations we came up with an *organizing concept* that stemmed from the list of the most important and preferred mission statements. This is what the RTID procedure was designed to achieve, an overarching theme that describes the underlying desire for direction and action, as expressed by the group throughout the whole deliberation process. The organizing concept is ultimately summarized into one or two lines that capture the main essence of what the *crowd* was trying to say. The organizing concept is

generated through content analysis of the statements: the identification of repeated words, themes, and ideas that appear across different categories and topics.

As in any other qualitative research process, various options for interpretation may exist and therefore several possible organizing concepts may emerge. The organizing concept should be presented to the participants, and/or to other relevant individuals or teams from within the organization in order to verify its soundness and correspondence with the final list of mission statements. Only when participants accept the *organizing concept*, does the deliberation process end and at this point the appropriate organizational teams should begin working towards putting the concept into action.

The organizing concept

In this study, through the mission statements that gained the highest scores, the participants expressed their aspiration to reduced bureaucracy, better work-life balance, communication, and knowledge sharing, increased involvement and influence as part of the decision-making processes, the need for rotations and internal shifts to prevent job stagnation, and the need for collaborative work spaces and open social networks in projects.

Through the mission statements the participants raised their concern that the current work space does not provide them with enough room to bring the full range of their talents, knowledge, and interests into action in their daily activities and assignments. Hence, they feel that they could contribute more, if they had more flexibility in using their talents, including those not directly related to their job, and if they would not only be assigned to pre-defined “fixed” positions.

Thus, the organizing concept that emerged and was validated by the participants of the deliberation was the following: In the future, work environment and procedures should enable employees to fulfill their full potential and optimally utilize their talent and aspirations. Specifically,

the collective deliberations raised the need of the future workplace to create *enablers* and open new *channels*, so that employees will be able to bring their abilities and aspirations into play in the best possible manner, both for their own benefit and for that of the organization.

The *enablers* that were identified were the following: *social responsibility, cutting-edge technologies, personalization, flexible work models, talent acquisition, and diversity*. The *channels* that were identified were the following: *Innovation and creativity, employee involvement and participation in day-to-day corporate decision making, leadership, and management development, employee development, and virtual and global work*.

Discussion

This study describes an effort to meaningfully engage employees of a global high-tech organization in an online crowd deliberation, aimed at identifying their preferable future workplace and problem solving in manufacturing and development processes. Based on the deliberations in this study, the preferred future of work is not about an advanced technological environment where robots and machines make human life easier. Rather, the preferred future of work place, as imagined by the employees who took part in the deliberations, is about fulfilling their hidden and known professional potential.

Employees would like to see a more flexible work hierarchy where employees can make the best of their full range of capabilities beyond the scope of a single role and fulfill their potential, knowing that the organization will gain from doing so.

The group of employees that took part in this study clearly leaned towards the fractal model for their work environment^{xx}. This model includes employees who will no longer have a single job description for several years, but rather repeatedly be assigned for temporary tasks and projects

based on their interests, capabilities, availability, aspirations, and future beliefs regarding the path their organization needs to take in manufacturing, research and development^{xxi}.

Some human resource professionals have been discussing a similar idea of internal *talent markets*, where employees are matched to projects according to their skills and interests, and not necessarily in accordance with their official credentials^{xxii}. In this study, however, we have seen that although the participants were not familiar with the concept of fractal organization and the previous attempts by HR professionals to clarify the pros and cons of the concept for organizations, they were able not only to arrive at the concept independently, but were also clearly able to define it as their preferred future of their work space at Intel.

The result of this study presented here provides an example of how organizations can harness their employees' wisdom to bring to the table cutting-edge ideas in manufacturing and production, debate their relevancy to their organization, agree collectively on their preferred path for the future and generate applicable ideas towards realizing their preferred future image.

The Real-Time-Imen-Delphi (RTID) procedure was designed to harness in an orderly manner the wisdom of groups in developing a desired future by engaging a group of stakeholders to deliberate anonymously online the issue at hand^{xxiii}. This study joins others that demonstrated that well organized deliberations, based on an established procedure, could assist a group of stakeholders to emerge and generate agreed upon ideas aimed at solving a dilemma. The specific dilemma behind this study was how to retain well educated and highly skilled manpower in the organization while providing employees with a sense of growth and personal development.

There are additional crowd-sourcing methods that support ideation whose application provides benefits for business organizations. For example, Prediction Markets is becoming increasingly

popular in using crowd wisdom to directly guide decision-making in businesses and manufacturing processes^{xxiv}.

The Futures Wheel procedure is another method designed to identify complex consequences of trends and events. Stakeholders use it to identify potential problems and opportunities, new markets, products, and services^{xxv}. Yet another methodology is “Idea Management,” which is a structured process that supports soliciting ideas from employees, evaluating them, and assessing the potential value of implementation^{xxvi}.

As social media tools and deliberation platforms evolve and become a central part of our lives, organizations will seek to involve employees in major conversations and in decision-making processes. RTID is a solid way in which to do this, as demonstrated in previous studies^{xxvii} and in this study as well. As one employee described it: “In the future, organizations will be a place where the individual employee will have a chance to influence, make a change, and leave his or her own mark”.

Clearly, then, organizations need to accumulate a tool box of sound procedures that can be run in little time or real time and on just a small number of manpower resources. The RTID could be part of that tool box.

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