HONDA'S PREDISPOSITION TOWARDS RADICAL AND DISRUPTIVE INNOVATIONS

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ABSTRACT:

Honda's long term view to R&D does not seem to hamper its 'nimbleness' to provide innovative products that are not only new to its historical business markets, but offer significant differentiating product attributes. Honda's recognized innovative prowess in most industries that it focuses upon leads us to ask the following two research questions: 1) What type of innovation approach (e.g. sustaining, radical or disruptive) differentiates Honda as being an innovative firm; and 2) What type of organizational approach supports the type of innovation that Honda generates?

A critical hermeneutical analysis of key R&D reports and second-hand interviews related to the HondaJet and Ridgeline product development initiatives followed by a review of past organizational research conducted on Honda as well as certain management literature on innovation generated the following results:

Product development programs showed clear patterns of coherency with technologies and design themes developed in preceding product development projects. Certain pertinent analogies were induced by these 'coherent innovation' patterns: namely, 'living' mythologies and societies, 'healthy doubt' or ambivalence in regards to retained knowledge, and creative routines. These analogies are a first indication of dialectics, whether as co-existence or synthesis of contradictions. A further

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examination of the management literature on Honda clearly indicates Honda's dialectical approach within the organization. Our own cross reference to technical reports and second-hand verbatim in relation to both the HondaJet and the Honda Ridgeline product development programs, as well as to their respective precursor development programs, revealed that the organizational approach can best be described as a dialectical holographic metaphor. There is also a clear relationship between Honda's dialectical holograph, especially in regards to knowledge creation as seen across the HondaJet and Honda Ridgeline development programs, and a general predisposition towards producing radical and disruptive innovations. A conceptual framework is proposed with the aim of providing further insights as to how an organization can achieve the dialectic holographic metaphor; and in turn, a general predisposition towards generating either radical or disruptive innovations.

Conclusions:

1) *Both the HondaJet and the Honda Ridgeline are viewed as being both radical and disruptive innovations. Furthermore, both product development programs showed clear patterns of coherency with technologies and design themes developed in preceding product development projects (hence, 'coherent innovation'). Hence, Honda's resulting innovations are simultaneously characterized by both continuity and novelty.*
2) *Honda's organizational approach in support of this type of innovation can best be described as a dialectical holographic metaphor.*
3) *Honda's approach is also in marked contrast to certain established literature as to how to attain disruptive innovations.*

***Keywords**: Radical innovation, disruptive innovation, dialectics, knowledge creation, knowledge sharing*

1.0 Introduction

Historically, the Honda Motor Co. has been somewhat of an enigma to various researchers in management – many contradictory positions seemed apparently justified when looking at various aspects in isolation. Its pursuit of R&D activities appears to pose the same paradox. Honda's long term view to R&D does not seem to hamper its 'nimbleness' to provide innovative products that are not only new to its historical business markets, but offer significant differentiating product attributes. For example, Honda's first experience and resounding success in the North American motorcycle market in the 1970's is described by Christensen (1997) as an example of having developed a disruptive technology across its 50 cc motorbike; while Honda's first pick-up truck (the Ridgeline) unveiled in 2005, won the NAIAS North American Truck of the Year Award in early 2006 with better than expected sales. And finally, its recent announcements to enter the microjet market across the commercialisation of its HondaJet aircraft appear to be consistent with Honda's history of never entering new markets with a "me-too" approach.

This conceptual paper first examines the evolution of the technical aspects and technologies that led to the differentiating attributes of the HondaJet and the Honda Ridgeline pick-up truck by conducting a critical hermeneutic analysis of public documents related to Honda's aerospace and automotive/pick-up truck R&D. Honda's R&D 'strategy' and activities are indeed coherent, but within a 'holographic' dialectical movement. We will also show that this movement provides a predisposition towards generating disruptive innovations as defined by Christensen (1997). We then propose a conceptual framework which identifies the enabling conditions and organisational dynamics that are required towards attaining Honda's 'holographic' dialectical movement.

2.0 The HondaJet

The HondaJet was first unveiled in December of 2003 and is described as being able to seat up to 6 people with a maximum

speed of 420 knots and service ceiling of 41,000 ft. The engines, being optimally positioned on the upper surface of the main wing in a unique configuration, reduce drag at high speeds and increase cruising efficiency. This also eliminates the need for structural engine mounts in the fuselage, which according to Honda, creates "30% more cabin space than in conventional aircraft" such as the Cessna Citation 550, the Gulfstream 100 and the Learjet 55 (Honda Worldwide, 2003). The main wing features aluminium skin panels formed from single sheets of aluminium to provide a smoother than conventional surface. This, combined with Honda's proprietary low-drag laminar flow wing (SMH-1) and fuselage nose sections work together to significantly improve aerodynamic performance. The fuselage's compact and lightweight carbon composite and honeycomb sandwich structure also provides added gains in interior space. All these features allow the aircraft to achieve fuel efficiencies up to 40% higher than conventional aircraft. In this regard, the HondaJet, with its radical improvement in existing product attributes of cabin space and fuel efficiency over other conventional aircraft, appears to represent a radical (as opposed to a disruptive) innovation in the spirit of Christensen's (1997) definition (disruptive innovations involve the introduction of new product attributes, while radical innovations involve step-change improvements in existing product attributes).

The evolution of these specific technologies can be traced back over three sequential aircraft research programs over the past 20 years. In 1986, a joint research agreement was first initiated between the Mississippi State University (MSU) and Honda R&D involving a Beech A-36 aircraft that was to be modified with a composite structure (Nakayama and Bennett, 1994). This was followed in 1989, with the MH-02 joint research aircraft project between MSU and Honda R&D, resulting in a prototype 6-passenger jet aircraft in 1992 (Nakayama and Bennett, 1994). It was described as being "the first all-composite small business jet, using lightweight carbon fibre reinforced epoxy resins in all the structural elements" (Honda Worldwide, 1997). As for the HondaJet itself, development began in the late 1990's.

2.1 Coherencies with precursor programs

A certain temporal coherency and continuity between the three aircraft development programs was discerned in terms of technology and design themes to the point that we can present it as being a series of 'coherent innovations'. Firstly, from a technology aspect, the converted Beech A-36 research program involved the learning and gaining of experience of composite material design, fabrication and testing (Nakayama and Bennett, 1994). Past rudimentary knowledge from the automotive sector, along with new trials and experimentation on the Beech A-36, allowed the MSU/Honda team to further learn "the basics of composite material technology and the basics of aircraft design, fabrication, and testing" (Nakayama and Bennett, 1994). This newly attained composites material knowledge, along with further advances in automotive experience in composite materials (resin mould fabrication), was subsequently used within the new context of the MH-02 forward swept-wing aircraft development program (Nakayama and Bennett, 1994; Sullivan et al, 1994). Hence, new composite materials knowledge was created in regards to all the structural elements of the aircraft ranging from main and tail wing cross beams and ribs, to fuselage frame and other outer panels of the aircraft. In a similar manner, composite materials knowledge acquired was subsequently carried forward into the context of the HondaJet program to thereby produce new knowledge with respect to the fuselage (Fujino, 2003; Black, 2006).

Secondly, the above-wing engine mounts were first seen on the MH-02 and were carried forward onto the HondaJet. Furthermore, the MH-02/HondaJet teams use of above wing engine mounts was inspired from decades-old technology found on such planes as the Fokker VFW-614. Yet, this technology, originally chosen for increasing cabin space, could not be used without synthesising it to new ideas, since in its original form presented poor drag characteristics. Across optimal engine nacelle and pylon positioning and design, what was originally a disadvantage eventually became a strong point, whereby drag characteristics were rendered *superior* to conventional under-the-wing designs (Fujino, 1994 and 2003).

Thirdly, an automobile design theme was discerned in both the MH-02 and the HondaJet: Fujino (1994) describes how one of the design requirements of the MH-02 was that crew and passengers could easily get on and off the aircraft without any steps, "just like an automobile"; and the chief test pilot mentioned "the crew seating is very low to the ground and provides a 'sports car' view and feel" (Wilson, 1995). As for the HondaJet, Honda's president Fukui explained "We have created a business jet with high performance, high fuel efficiency, low emissions and a spacious cabin. Sounds like a Honda, right?" (Phelps, 2004a).

The manner in which radical improvements in existing product attributes were achieved helped produce a new product attribute (relative to other competitors): namely, the car-like comfort and handling to the aircraft. Aircraft manoeuvrability coupled with other technologies and design themes already described also contributed towards producing this new and therefore disruptive product attribute. In this sense, the HondaJet can be viewed as being both a radical and a disruptive innovation in the spirit of Christensen's (1997) definition (Figure 1).

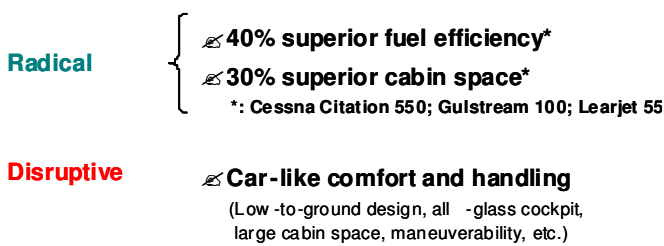

Figure 1. Radical and disruptive product attributes of the HondaJet

3.0 The Honda Ridgeline

Between its first launch (2005) and having won the NAIAS 2006 North American Truck of the Year Award, Honda's first pick-up truck was described by numerous automotive reviews as a vehicle

that “doesn't look or act like any other pickup truck we've ever driven”…“ is one of the nicest midsize trucks driven in terms of comfort and ease of use”…“sets a new paradigm in terms of body structure for a pick-up”, whereby “Honda steps up and redefines the genre with… the most innovative vehicle in a long time” (McGraw, 2005; Vanderwerp, 2005; Truett, 2005).

Innovative highlights of the Ridgeline include: 1) integrated cab and bed unibody construction, resulting in a body-chassis structure with 20X the tensional stiffness and 2.5X the bending stiffness of a competitive body-on-frame truck; 2) first four-wheel, fully independent suspension system to deliver a superior car-like ride and handling, while maintaining the conventional strength of a truck; 3) the industry’s first in-bed trunk, made possible across the elimination of the full rear-axle; and 4) a dual action tailgate, hinged at the bottom and side for drop-down and swing-out operations, thus giving easier access to the trunk (Honda Canada, 2005).

The differentiating attributes of the Ridgeline can be summarised as: a mid-size truck offering superior cabin and rear-bed space with a loading capacity matching large-sized pick-ups; coupled with car-like comfort and handling (McGraw, 2005; Vanderwerp, 2005; Truett, 2005). Superior improvements in existing product attributes (e.g. strength and stiffness), along with the incorporation of new car-like performance attributes (comfort, handling, cabin space) relative to existing competitive pick-up truck attributes, allows us to also consider the Ridgeline as both a radical and disruptive innovation (Figure 2) as defined by Christensen (1997).

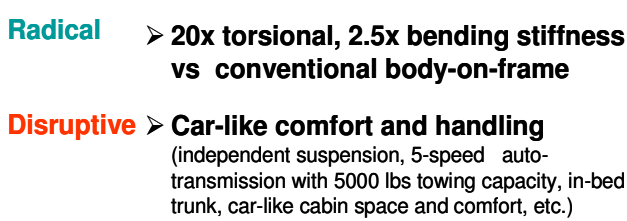

Figure 2. Radical and disruptive product attributes of the Honda Ridgeline

3.1 Coherencies with precursor programs

A core team of 37 engineers, led by project engineer Gary Flint, did the engineering design work on the truck in a little over four years. The total development time was five years. During this period at least two separate prototypes were built prior to attaining the final design product. One paradoxical comment, comes from Lindsay Brooke, a senior analyst at CSM Worldwide, stating that "For decades, they've [Honda] mastered the art of developing new vehicles without creating all-new ones, using many carryover parts and common assembly processes" (Truett, 2005). Brooke's comments are certainly valid when considering that the starting point of many of the Ridgeline's innovative features such as the unibody construction and the car-like suspension and transmission began with the Honda Pilot and Honda MDX (both SUV's). In this respect we see a continuity with Honda's past experience thus resulting in 'coherent innovation' as discerned in our analysis of the HondaJet. Yet, although the Ridgeline's integrated body-on-frame chassis construction stems from the Honda Pilot SUV, the structure has been significantly changed, with 93 percent being unique to the new truck. The Pilot's five-speed automatic has been extensively reengineered for pickup duty, helping to give the Ridgeline a 5000-pound towing capacity. The front-strut, rear-multilink suspension design is also carried over from the Pilot, but it, too, has been strengthened to handle additional loads (Vanderwerp, 2005). In a similar way, the Ridgeline team tapped into old 'station-wagon' technology for the dual action tailgate. But its original configuration, presented significant load strength disadvantages. Hence new knowledge was introduced so that, according to Flint, "The tailgate is so strong, I can back two trucks up to each other and I can park another Ridgeline on top of them" (Peter, 2005).

4.0 A Few Pertinent Analogies to Honda's Coherent Technologies and Design Themes

The coherent aspects of technologies and design themes which culminated in the HondaJet and Ridgeline remind us of pertinent analogies. Within both development programs, past and existing knowledge was used as a starting point, yet could not be used as is without certain transformations so as to address the new contexts the development programs faced.

Enriquez's (1992) explanation of 'living' mythologies which found in societies that evolve and adapt themselves to changing environments reminds us of Honda's 'coherent innovation'. Such mythologies simultaneously (and continuously) view themselves as being both 'truths' and 'non-truths'. The 'truths' are the aspects of past and existing knowledge which apply to a new situation or context, while the 'non-truths' are the aspects of past and existing knowledge which are no longer pertinent to the new situation or context at hand. It is the mythology's (or society's) self-recognition of these 'non-truth' that opens the way to new ideas and concepts, which in turn, aid it in addressing environmental change. Hence, the mythology (or society) remains 'living'. Conversely, 'dead' mythologies (or societies) are those which consider themselves as being 'absolute truths'. Past and existing knowledge (which are identical, in this case) have no dimensions of 'non-truths', and as a result fail to embrace new ideas or concepts that can aid it in addressing new environmental change or perturbations (Enriquez, 1992).

In a similar vein, Weick (1979 and 2001) speaks of 'living' organisations and "high reliability organisations" which maintain a relative balance between 'crediting' and 'discrediting' its retained knowledge (past and current practices, experiences, logics and beliefs). Organisations that always 'credit' their retained knowledge are those which are non-innovative and fail to adapt to change, while those that that always 'discredit' their retained knowledge fail to learn from past experience, and often end up 're-inventing the wheel'. In order to maintain a proper balance between 'crediting' and 'discrediting', organisations must maintain

a "healthy doubt" or "ambivalence" towards its own current beliefs and understandings (Weick, 1979 and 2001).

A third analogy to Honda's 'coherent innovation' is that of "creative routines" defined by Nonaka and Toyama (2002). As opposed to 'frozen' or inertia setting routines, creative routines synthesise both standardisation (or efficiency) and creative change (innovation).

The above-three analogies illustrate a certain ambidexterity, that is, exploitation in co-existence with exploration. It also illustrates 'symptoms' of dialectics of opposing elements (in our case, past/current knowledge versus new knowledge). This can either tend towards the more Western Hegelian type of dialectics involving a synthesis of opposing elements (in our case, creative routines), or the more Eastern type of dialectics involving the co-existence of contradiction (e.g. ambivalence or healthy doubt towards retained knowledge) – Peng and Akutsu, 2001. This tentative theme of dialectics on our part brings us to the following sub-section which attempts to shed further light on Honda's organisational approach.

5.0 The Honda Motor Company as a Dialectical Holographic Metaphor

Most researchers would agree with Cooper (2005) that Honda is an "industry innovator". Yet researchers from different schools of strategic management thinking have used Honda to support a variety of theses. Mair (1999) critically analysed much of this previous literature and argued that Honda had been cited to illustrate "apparently contradictory positions on a series of conceptual dichotomies, namely analytical planning versus learning, market positioning versus resource-based and…core competencies versus core capabilities". He explained that Honda's management thinking is based on the reconciliation of conceptual dichotomies which in turn produced Honda's dichotomy-reconciling strategic capability, as well as being a "specific route to innovation". This argument rejoins Pascale's (1990) description of Honda's management as being able to use paradox and contradiction as an explicit management tool. Nonaka et al (2002

and 2004) go further by providing an explicit explanation as to how contradiction within an organisation is embraced and harnessed in a dialectical fashion (often citing Honda as an example) leading a continuous process of knowledge creation, innovation and overall business strategy. The following examples of Honda's synthesising of opposites across various epistemological and ontological levels of the firm reminds us of Morgan's (1986) "holographic metaphor" in regards to a dialectical system: that is 'the whole can be found within its parts'.

5.1 A knowledge vision which synthesises Honda's absolute and relative value systems

The knowledge vision provides an important criterion for judging the value of knowledge perceived or created, and fosters a context of organisational *commitment* towards creating and circulating knowledge across the organisation (Nonaka and Takeuchi, 2004). According to Nonaka and Toyama (2002), Honda has a knowledge vision synthesising both the absolute and relative value systems of the firm. On the one hand, it emphasises a vision which is not affected by outside conditions to ensure that it can achieve consistency and uniqueness in its knowledge creating activities. On the other hand, Honda cannot ignore the environment with which it interacts. It needs to adjust its activities to the changes in the environment (competitors, etc.). Across the words of Honda president Fukui, we discern a knowledge vision which synthesises both aspects: "Mobility is a basic desire, right and joy for all people. Honda continues to pursue mobility from all dimensions. Mobility in the third dimension – the sky – was a dream we have had since shortly after our company was founded. The words of our founder, 'Do not imitate others' are burned in the minds of everyone at Honda. We have no interest in following." (Phelps, 2004a). All generated knowledge will, on the one hand, be judged against the absolute criteria of mobility and uniqueness, and on the other hand, against the relative criteria of pursuing 'the third dimension – the sky'. The HondaJet with 30% more cabin space and 40% higher fuel efficiency than conventional aircraft clearly meets both criteria.

5.2 Synthesis of realistic and idealistic principles

According to Nonaka and Toyama (2002), Honda uses "two contradicting principles" in daily practice. One is the emphasis on the importance of reality or 'go to the actual place, know the actual situation, be realistic'. For example, Gary Flint, in the development of the Ridgeline, refers to the Japanese term *sangen-shugi*, which means "go to the spot", which he used towards conducting his own market research on customer wants and needs (which was conducted over and above the traditional listening to customer focus groups). The other principle is emphasis on the importance of the ideal by respecting 'sound theory'. In this regard, the Ridgeline development team used the theory behind unibody construction to gain additional resistance to bending and twisting. Yet, as Truett's (2005) explains, "Honda engineers can't just show their bosses diagrams and drawings. They have to design parts that solve problems".

Honda also synthesise practice and theory across three levels of questions (Nonaka *et al*, 2002). One level will look at specifications such as 'what is the aircraft cabin space?' etc. A higher level will look at conceptual and design issues such as 'what is the design of the aircraft cabin?' The highest level will look at basic essential questions, such as 'what is this aircraft for?' When a problem cannot be solved, Honda engineers go up a level in terms of questioning: so if the cabin design cannot be agreed upon, they go back up to 'what is this aircraft for?'.

5.3 Synthesis of consensus/respect and open debate

Kiernan (1996) describes how at Honda the constant questioning of ideas, decisions and management is encouraged, even demanded of each employee. Kiernan adds, "Design and development teams are deliberately staffed with engineers from peripheral disciplines who are unfamiliar with the core technology under development. This is to ensure that problems will be approached from different and innovative perspectives, and that conventional wisdom will be challenged and tested." Along these lines, Kiernan also refers to

Pascale (1990) in regards to Honda's art of 'constructive contention' or *Waigaya* – a contention management protocol where people listen to one another, and can disagree without being disagreeable. This requires management being skilful at facilitating "so as to surface thoughts and feelings present and move toward constructive action" (Pascale, 1996). Hence, *Waigaya* can be viewed as a synthesis of open debate and consensus/respect. Such a synthesis is discerned within the Ridgeline's project development team who "debate, discuss, examine and analyse the engineering and marketing data and from that, they implement a comprehensive product plan. Then they set to work. Once a decision is made, that's it - unless, of course, a team member comes up with new and compelling data. Then the action plan can be revisited" (Cato, 2005).

5.4 Synthesis of different ideas: past vs present, internal vs external, existing vs new

Nonaka and Toyama (2002 and 2004) explain that idea creation can be achieved across the synthesis or integration of opposing aspects through a dynamic process of dialogue and practice. This is precisely what is seen across the team dynamics throughout the development of the Ridgeline pick-up truck, and can also be deduced across some of the R&D documents describing Honda's aviation development activities. The opposing aspects of interest in this case consist of different ideas being discussed and debated, prior to consensus. For example, some of these ideas can be categorised as existing 'in-house' vs existing 'external' ideas, across the Ridgeline team's examination of in-house experience in relation to both the Honda Pilot and MDX in regards to unibody construction, suspension and transmission vs. the teams examination of competitive 'best practices', otherwise known as *zembara* (which Flint explains as "where we took competitive vehicles apart, down to the last bolt, and took note of their construction -- who had the best technique" – Peter, 2005). This exercise culminated into two prototypes being built to test vehicle dynamics and validate all of the modelling and development work, or as Flint said, "to make sure we were going down the right

path...The first one...had a [Ford] SportTrac bed in it" (Peter, 2005). The second iteration used a Honda Acura MDX cabin with exclusive side panels.

Both the Ridgeline and MH-02/Hondajet teams also tapped into past knowledge as a source of additional ideas. For example, the MH-02/HondaJet teams use of above wing engine mounts was inspired from decades-old technology found on such planes as the Fokker VFW-614. But this technology, originally chosen for increasing cabin space, could not be used without synthesising it to new ideas, since in its original form presented poor drag characteristics. Eventually, via optimal engine nacelle and pylon positioning and design, what was originally a disadvantage became a strong point, whereby drag characteristics *superior* to conventional under-the-wing designs (Fujino, 1994 and 2003). In a similar way, the Ridgeline team tapped into, and subsequently improved, old 'station-wagon' technology for the "Dual Action" tailgate.

6.0 A Predisposition towards Creating Disruptive Innovation

We already saw across Honda's synthesis of 'contradictions', that a large number of possible dyadic pairs may exist depending on the context at hand (e.g. tacit vs explicit knowledge, external vs internal knowledge, theory vs practice, cooperation vs competition, etc.). Furthermore, each series of differing viewpoints offers a multitude of dyadic arrangements of concepts to be synthesised across dialectical interactions and sense-making between individuals or groups of individuals via dialogue and practice. Hence, complementary oppositions or contradictions are not entrapped in an "either/or" dichotomy, and thereby avoid being limited to only one half of the dynamics within the vast spectrum of dyadic 'pairs'.

It can also be argued that dialectical synthesis also has natural affinities towards achieving disruptive innovations as defined by Christensen (1997). Disruptive innovation involves products that offer new product attributes (as opposed to radical and sustaining innovation which involve products with radical and moderate improvements in *existing* product performance attributes

respectively). In focusing on the visible product innovation aspect, we could simplistically say that the past vs present/old vs new/internal vs external series of knowledge related dyads as described in section 5.5 are the ones most directly related towards having produced the disruptive innovations as represented across the Ridgeline pick-up truck and the HondaJet.

Christensen's (1997) illustrates examples of disruptive innovations deriving from "off-the-shelf" components put together in a product architecture that is different and often simpler than prior approaches. Thus, disruptive innovations often involve existing off-the-shelf knowledge and technologies being synthesised with new knowledge (e.g. new architectures, assemblies or interfaces) and/or internal knowledge being synthesised with external knowledge. In many ways, the same can be said for the Honda Ridgeline and the HondaJet, which represented existing knowledge (which in itself involved the synthesis of internal and external knowledge) synthesised with new knowledge (e.g. new ways of putting this existing knowledge together, new unibody construction, optimisation of engine position and nacelles, etc.); hence, resulting in a pick-up truck or aircraft that has all the existing performance attributes of conventional products combined with the added performance attribute of car-like handling, space and comfort.

The dialectical synthesis approach allows for *partial* ruptures with past and existing knowledge, while also allowing for building upon this same existing knowledge; essentially the same pattern discerned within Honda's 'coherent technologies' in sections 2.1 and 3.1. For example, although the Ridgeline's integrated body-on-frame chassis construction stems from the Honda Pilot SUV, the structure had been significantly changed, with 93 percent being unique to the new truck. The Pilot's five-speed automatic transmission had also been extensively reengineered for pickup duty, helping to give the Ridgeline a 5000-pound towing capacity. The front-strut, rear-multilink suspension design was also carried over from the Pilot, but it, too, was strengthened to handle additional loads (Vanderwerp, 2005).

Consistent with Christensen's argument that disruptive innovation need not be costly relative to radical or sustaining

innovation, the Ridgeline's project team leader Gary Flint, who worked 15 years at GM prior to joining Honda 12 years ago, explained that "The project's total cost came in well under $250 million. Compared to General Motors, (the Ridgeline's cost) is peanuts," (Truett, 2005). Although we could not obtain direct product development cost comparisons between the Ridgeline and its competitors for 2005 (which is the year the Ridgeline was unveiled), generic 2002 data showed GM to be spending over $400 million per product development project (Welch, 2002). Yet, GM designs were at that time viewed as being relatively dull and "stodgy" (Welch, 2002).

6.1 A Major departure from Christensen's approach

A paradox in this paper is that while we have argued the case that Honda's dialectical, and therefore ambidextrous, approach generates a natural affinity towards producing both radical and disruptive innovations as defined by Christensen (1997), a major epistemological departure from Christensen is worth noting. One of Christensen's (1997) theses is that efficiency and creativity cannot intimately co-exist or interpenetrate one another. Christensen correctly highlights examples of historically successful (and initially innovative) corporations having progressively lost their creative edge across the imposition of large inertia-setting organisational routines. On the one hand, Christensen (1997: 200-202) argues that such an outcome is understandable and even justifiable, in that these routines are meant to be 'frozen' or unchanging in order to maximise efficiency. Christensen's solution for addressing this dilemma is to have the existing organisational entity re-invigorate its creativity by either acquiring or creating a new organisational 'arm'. In this manner, the new 'creative arm' will not be hampered by the existing organisational system. Yet, at a certain stage in growth this new organisational 'arm' needs to establish certain internal efficiencies in order to truly achieve significant levels of productivity and profitabilities. What happens when this 'arm' eventually starts to routinise its own initially innovative successes? We are then obliged to re-start the whole process of acquiring or

creating another new 'creative' arm. Christensen's approach implies that any given locus within the overall organisation is either creative or efficient, but not both. This deductive logic not only resembles the deductive 'pendulum swinging' criticised in the previous sub-section, but on meso and more micro organisational level creates barriers to knowledge sharing. One of the strengths of Honda, according to Nonoka and Toyama (2002) is in its ability to synthesise both systemised explicit knowledge with the often more tacit conceptual knowledge (e.g. "creative routines"). This implies both a co-existence as well as a synthesis between efficiency and creativity. Furthermore, this dialectic and ambidextrous approach, as seen in sections 5.1 through 5.6 is seen across all ontological levels of the organisation, thereby producing a holographic metaphor. This is in stark contrast to Christensen's (1997) segregation between creativity and efficiency.

As argued above, Christensen's (1997) proposed methods of achieving disruptive innovation does not appear to concur with Honda's approach. Yet, certain authors appear to have mistaken Christensen's proposed methods with his definitions of what sustaining, radical and disruptive innovation consist of. For example, Nonaka, Kohlbacher and Holden's (2006: 40) adherence to the dialectical synthesis of knowledge (as also proposed in this paper) make the assumption that only sustaining innovation can be produced under such an environment, in that coherent continuity via dialectics is only synonymous with sustaining innovation. Our own examination of Christensen's (1997) definition, as well as the nature of the innovation produced by Honda suggest otherwise. In fact, and as repeatedly argued, we feel that Honda's dialectical and holographic approach, on the contrary, has clear affinities and predispositions towards producing both disruptive and radical innovations.

7.0 Possible Insights as to How to Achieve a Dialectical Holographic Organisation

According to Nonaka and Takeuchi (1995), the synthesising of opposites within Honda is conducted through SECI (socialisation, externalisation, combination, internalisation). Although we do not

disagree with Nonaka and Takeuchi's (1995) approach, we believe that a complementary aspect that can further enrich our understanding as to the nature of the dynamics involved in a dialectical organisation resides in examining both group dynamics and organisational sense-making. The group, according to Enriquez (1992: 97 and 101), "constitutes the privileged location for the comprehension of collective phenomena", whereby the "the group only establishes itself around an action to accomplish, a project to work on or a task to complete". When speaking of human interpretation, it is also important to consider the sense-making process as defined by Weick (1995: 14): "the concept of sense-making is valuable because it highlights the invention that precedes interpretation".

An ambivalent attitude (or "healthy doubt") allows for a reasonable equilibrium between trust and disbelief towards past experience and therefore avoids organisations from either becoming ultra-stable or ultra-flexible (Weick, 1979 and 2001). Weick's call for a balance between the 'crediting' and 'discrediting' of retained experiences, beliefs and logics, also rejoins Enriquez's (1992) description of work groups that actively thrive in ambiguity-embracing dynamics (or where contradictions both co-exist and interact with one another): that is, work groups that promote both individual emancipation of its members in conjunction with a visible sense of group identity. Here, both individual emancipation and group identity interact dialectically so as to reinforce one another. Such groups, referred to as *differentiated* groups, is characterised by members who respect and tolerate each other's differences, alongside open dialogue/debate of different viewpoints (hence, another dynamic ambiguity). Enabling conditions for such group dynamics include empathy, autonomy, as well as mutual trust and respect between its members (Enriquez, 1992). Furthermore, preliminary indications from our own on-going qualitative research (interviews and observations within an embedded case study) within an important North American aircraft engine manufacturing company suggests that differentiated groups tend to be open to other group's ideas, all the while not losing their own group identities and ideas. This is also consistent with Stevenson's (2002) concept of local communities interacting with

one another within an increasingly global network. Such a community, according to Stevenson (2002: 743), "recognises that, to be creative and viable...it must be inclusive of differences and open to change...Ideas flow in and out. Such a community recognises it has much to learn from others. Complementarities are celebrated". This is on condition that the enabling conditions listed above that are present within the workgroup are also present at the group interfaces (e.g. formal or informal meetings and discussions). In such situations, integration of other group ideas occurs simultaneously with the creation of differentiated ideas within the group, thus keeping a healthy balance between integration and differentiation.

7.1 Required enabling conditions

Nonaka and Takeuchi (1995 and 2004) speak of various conditions that enable organisational knowledge creation and circulation to occur. One of these enabling conditions is, as discussed earlier, instilling a *knowledge vision*. But in order for this knowledge to interact in a manner that involves the continuous re-visiting and re-adjustments of ideas and concepts in a manner that integrates and synthesises the continual input of differing viewpoints and 'contradictions' (or dyads), individuals must first feel secure to interact with one another in an environment of openness, tolerance, and respect. Hence, it becomes primordial that there be an environment in which management nurtures mutual trust, empathy, and care, whereby individuals are more likely to share their personal contexts and knowledge leading to what Nonaka et al (1998) refer to as '*ba*'. But it also means that there is more likelihood for tolerance and openness to differing viewpoints, whereby discussions as well as open debating of ideas can occur within a context of respect and mutual trust. This openness and tolerance on the part of individuals not only allows synthesis of various knowledge dyads to occur (thereby increasing the chances of generating disruptive innovations), but also allows different ontological (individual to group to sub-organisation) and epistemological (tacit and explicit knowledge) dyads to synthesise together thereby leading towards the dialectical holographic firm.

Openness to differing viewpoints coupled with the somewhat more classical enabler of requisite variety (Ashby, 1956) of personal experiences and backgrounds espoused by evolutionary economic and complexity theorists alike (postulating that an organisation's internal diversity must match the variety and complexity of the environment in order to deal with its challenges) increases the likelihood that peripheral ideas or 'weak signals' as described by Day and Schoemaker (2005) are integrated within the knowledge creation process. This again, increases the likelihood of generating disruptive innovations. The fostering of debate and eventual synthesis of differing ideas at Honda is one source of requisite variety. But having people with different backgrounds and functions around a table amplifies this requisite variety. Kiernan's (1996) describes this of Honda: "Design and development teams are deliberately staffed with engineers from peripheral disciplines who are unfamiliar with the core technology under development. This is designed to ensure that problems will be approached from different and innovative perspectives…". Some of the technology leveraging of Honda's existing automotive technologies into the MH-02 and HondaJet aircraft development programs may in part be explained by the presence of engineers from peripheral disciplines involved in both programs.

Added to this is redundancy of information or knowledge whereby there is an existence of information or knowledge that goes beyond the immediate operational requirements of organisational members. This involves the intentional overlapping of information and business activities and management responsibilities. By sharing a concept with other individuals who may not need the concept immediately, more sharing of tacit knowledge is promoted because an individual can sense what others are trying to articulate. In this sense, redundancy of information speeds up the knowledge-creation process. An example would be in concept development whereby individuals are trying to articulate images rooted in tacit knowledge: here redundant information enables individuals to invade each other's functional boundaries and offer advice or provide new information

from different perspectives (Nonaka and Takeuchi, 1995). This is reflected in Honda's brainstorming camps, where these "meetings are not limited to project team members but are open to any employees who are interested in the development project underway" (1995: 63). This too, can increase the likelihood of generating disruptive innovations.

7.2 A proposed conceptual framework

A proposed conceptual framework based on what has been presented so far is shown in Figure 3. Differentiated groups are formed and nurtured across the establishment of a knowledge vision that is pertinent to each particular group (this provides a collective vision, will and identity that will aid in choosing and implementing the most promising ideas), care, empathy and mutual trust (to allow members to openly share and debate differing viewpoints without feeling threatened or fear of being ostracised), requisite variety (to enrich differing points of views, ideas and concepts via differing backgrounds, skills and experience as well as by voluntary job rotation), and finally, redundancy of knowledge (to enhance sharing of ideas and viewpoints). Each group's knowledge vision integrates upper management's knowledge vision, while also addressing the realities of the group's specific context. Such teams at Honda are led by middle-management, providing the link between upper management's vision and front-line reality (Nonaka and Takeuchi, 1995). Furthermore, upper management at Honda also act as a team (Kiernan, 1996) in a manner that is very similar to the team-centric approach described by Smith and Tushman (2005). Here, interactions occur, whereby debate is common, yet across frequent interactions make it possible for resolutions, as well as knowledge complexification. Yet, as suggested in section 7.0, the locus of organisational integration is not just limited at the senior level – it occurs across the organisation across differentiated work groups, whereby middle-management play the lead role.

We can argue that a knowledge vision and redundancy of knowledge tends to support the knowledge integration aspect of the organisation, while mutual trust, care, empathy and requisite variety will tend to support the knowledge differentiation aspect of the organisation. In turn, the nurtured differentiated groups, supported by these enabling conditions, will actively generate various types of dialectical processes which originate from their active embracement of dynamic ambiguities such as individual emancipation vs group identity, tolerance and respect vs open debate, and 'healthy doubt' in regards to the groups retained knowledge. Furthermore, by ensuring these same enabling conditions at group interfaces between interacting differentiated groups, the process of dialectics (and thus knowledge creation and sharing) is amplified so as to produce a holographic metaphor. Hence, this holographic metaphor is maintained across a network of interacting teams which have distinctive identities (Hackman, 2002), yet are also open to other groups' input (Stevenson, 2002). In turn, this organisational 'structure' produces affinities towards generating radical and disruptive innovation. Finally, risk is minimised since the 'best of both worlds' is continuously sought, that is efficiencies by integrating lessons-learned across the organisation based on retained knowledge, all the while seeking on-going new knowledge creation so as to continuously adapt to the changing environment. Our definition of risk is, on the one hand, relatively straight-forwards whereby consequences (as an undesirable event) are actual events which originate from inherent risk (Black, 2003); while, on the other hand, we view various risk categories (cost, quality, social, health and safety, etc.) as being inter-related (Perrow, 1984; Beck, 2002). This is based on Latour's (1993) epistemology which sees categories being continually hybridised and inter-related, whereby our traditional Cartesian notion of categories is but a "purified" (and therefore simplified) approximation of reality.

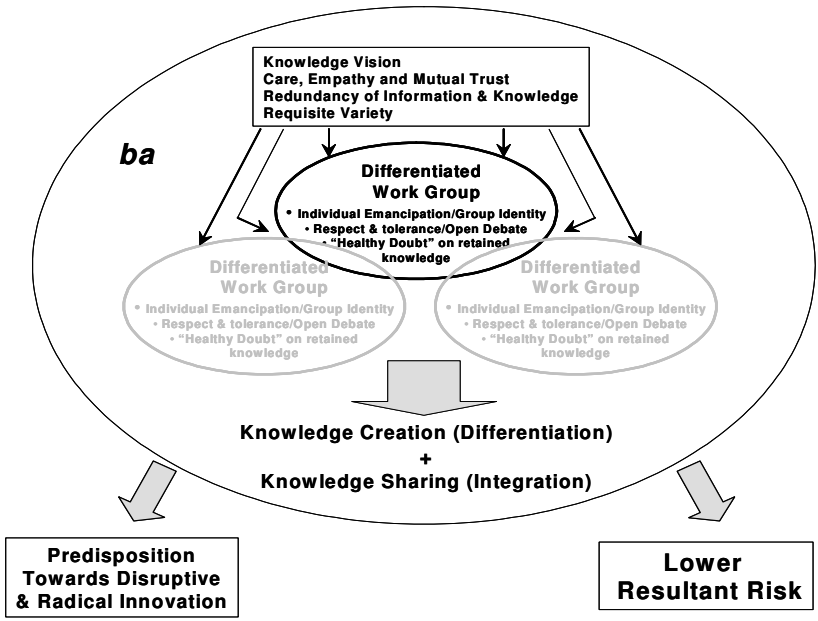

Figure 3. Group dynamics and enabling conditions supporting a dialectic holographic metaphor

How effectively we can reduce risk depends on how well we can complexify our knowledge (Weick, 2001) and thereby minimise the presence of tightly coupled systems (Perrow, 1984). Knowledge complexification is achieved by integrating as many aspects of knowledge as possible (i.e. tacit vs explicit, old vs new, rational vs intuitive/emotional, etc.) – Beck, 2002. The organisation as a dialectical holographic metaphor (as opposed to the linear-causal characteristics of tightly coupled organisations or systems – Perrow, 1984), is an effective way to achieve such knowledge complexification, and thereby reduce risk – all the while increasing our predisposition towards radical and disruptive innovation. This overall outcome, which seems to go against Cartesian 'intuition', tends to be supported by our second-hand analysis of Honda, along with our comparison to the more efficiency-driven firms such as GM and Ford.

Finally, it is perhaps prudent to discuss the issue of transferability in relation to different cultural contexts. Throughout our analysis of Honda, one could argue that Japanese practices are not transferable to Western contexts due to cultural differences. For example, Nonaka and Takeuchi (1995) explain that there is a greater emphasis placed on socialisation within the Japanese workplace when compared to North America. This argument holds a certain degree of validity, but as Kélada (1996: 178) points out "although we must recognise the great difference between American and Japanese cultures, we cannot dismiss all Japanese management practices as being culture oriented and continue to think that anything that does not originate in the United States cannot be applied". For example, Kennly and Florida (1995) argued that Japanese management styles had been successfully transferred over in the automotive industry, involving Toyota (NUMMI) and Honda plants in the United States, and "that there is ample evidence that where Japanese firms have undertaken a concentrated and sustained effort they have been successful in transferring their labour-management system to the USA". Our own hermeneutic study included verbatim and data originating from Honda within a North American context, and seemed to show a reasonable degree of correlation with Japanese literature on knowledge management (Nonaka et al, 2002, 2003 and 2004). Yet, we acknowledge that the issue of culture is complex and highlights the need to conduct empirical studies within Japanese companies such as Honda that are situated within various contexts around the world.

8. Summary and Conclusions

In the first section of this paper, we briefly examined the evolution of certain technologies and design themes that culminated into the HondaJet and the Honda Ridgeline respectively. Both products are viewed as being both radical and disruptive innovations according to Christensen's (1997) definition. Furthermore, both product development programs showed clear patterns of coherency with technologies and design themes developed in preceding product

development projects. Certain pertinent analogies were induced by these 'coherent innovation' patterns: namely, 'living' mythologies and societies, 'healthy doubt' or ambivalence in regards to retained knowledge, and creative routines. These analogies are a first indication of dialectics, whether as co-existence or synthesis of contradictions. A further examination of the management literature on Honda clearly indicates Honda's dialectical approach within the organisation. Our own cross reference to technical reports and second-hand verbatim in relation to both the HondaJet and the Honda Ridgeline product development programs, as well as to their respective precursor development programs, revealed that the organisational approach can best be described as a dialectical holographic metaphor. There is also a clear relationship between Honda's dialectical holograph, especially in regards to knowledge creation as seen across the HondaJet and Honda Ridgeline development programs, and a general predisposition towards producing radical and disruptive innovations according to Christensen's (1997) definition. Honda's organisational approach also offers lower overall risks when compared to the more traditional 'deductive pendulum swinging' approach. Yet, Honda's approach is also in marked contrast to Christensen's (1997) own epistemology and proposed process as to how to attain disruptive innovations.

Borrowing from both Enriquez (1992) and Weick (1979 and 1995) in regards to group dynamics and organisational sense-making, and certain associated key enabling conditions, we propose a conceptual framework that we hope can provide further insights as to how an organisation can achieve the dialectic holographic metaphor; and in turn, a general predisposition towards generating either radical or disruptive innovations. Managing an organisation within a dialectical firm, with its very nature of constantly requiring an openness to alternative and differing views, aspects and concepts, requires special emphasis on mutual trust, care and empathy so that individuals and groups feel comfortable and secure in the sharing and exchanging of views and ideas. Furthermore, requisite variety of backgrounds and experience, as well as redundancy of knowledge further enhances this sharing and exchange so as to produce a richer and more

complex knowledge able to cope with the complexities and turbulence of the environment. It is this synthesis of various 'contradictions' or viewpoints that gives the firm and its resulting disruptive innovations the simultaneous characteristic of continuity and novelty.

A major weakness of this paper lies in its purely conceptual nature, and that it relies solely on second hand verbatim and technical data. Qualitative fieldwork is currently on-going at a major North American aircraft engine manufacturer towards verifying the validity and veracity of our hermeneutic 'findings'. Future work is also being envisaged towards conducting field work within the Honda Motor Co.

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