

DESIGN



To

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
COMPTON GALLERY
MARCH 17-APRIL 29, 1994

Valérie



Vista 350 MODULAR PHONE

CORPORATE INFORMATION

CORPORATE NAME

Northern Telecom, Ltd.

HEADQUARTERS

Mississauga, Ontario, Canada

REVENUES

\$8.4 billion (U.S.)

NUMBER OF EMPLOYEES WORLDWIDE

58,000

PRODUCTS

Digital telecommunications equipment: switching and transmission systems, private networks, wireless systems, terminals, and components. (Terminals are devices, such as a phoneset, that end a connection.)

MARKET

Primary Direct: Telephone operating companies (telcos) in North America
Secondary/Indirect: Residential, business, education, government, hospitals
25% of Northern's revenues come from outside North America

SUBSIDIARY

Bell-Northern Research (BNR) is the research and development subsidiary of Northern Telecom (70%) and Bell Canada (30%). Bell Canada is the largest telecommunications operating company in Canada, and Northern Telecom is its preferred supplier of digital equipment. BNR's major role is to develop products for NT to sell to the telcos. Based in Ottawa, BNR has development labs in six countries in North America, Europe, and the Pacific. Its 9,000 employees have an R&D budget of \$1 billion (U.S.). BNR uses a gating process for managing development, and must have an NT partner (from product management) prior to Gate 0 (the go/no go review).

NORTHERN

TELECOM



VISTA 250/350 MODULAR PHONESET

John Tyson joined NT as its first industrial designer in 1966. He established Design Interpretive (DI) in 1973, and became its first director. A decade later, he consciously "opted out of design. I got tired of talking about design and pushing. I decided to go to the other side and pull. On the other side, they don't value design. It's largely invisible." Eight years later, NT chairman Paul Stern, and BNR president George Smith, came to the conclusion that design was very underleveraged at BNR, and needed to be reinvented if Northern was to achieve industry leadership in digital telecommunications. They called upon Tyson, then vice president for market development in NT's transmission group, to do "something big" with his old group.

In the April 1992 "reset" of CDG, there was one thing that did not change: the location of Design in R&D — i.e., in BNR. Tyson believes this is the right place for CDG to be because "the culture of R&D has a longer planning horizon, it tolerates more eccentricity, it has different criteria for hiring, and different values for nurturing and developing resources." He was pleased, therefore, when Stern and Smith chose to leave Design in BNR: "They made the right decision before I was even in the loop, and, even more important, they made it for the right reasons."

The core concept from which the reset evolved was that Design was to be a center of excellence. There is no mechanistic definition of this concept, but if one listens carefully to Tyson's metaphoric language, a center of excellence can be described as the entity that emerges from the holistic convergence of accountability, value, and leadership. Value and accountability deeply inform Tyson's view of design, and form the heart of his insights into leadership. He is committed to the view that "you design to value, not to form. In Corporate Design, our core competence is understanding user and chooser values. Our view is outside-in." Accountability means that "we're accountable for the value we contribute to the corporation. We give it away. We give to. The value accrues to our partner. We invest in our partner." He observes that "most people operate as if value accrues to themselves. But the value of the work you do accrues to your partners, and to the user or chooser of the product."

Tyson believes that "the design process should be guided by design principles based on user values. We've spent a lot of time trying to work to some principles that we believe express the value of our function." The three key design principles guiding all CDG work are profound simplicity, conspicuous customer value, and self-evident operation. These refer to the elegant elimination of all mystification in systems and their interfaces, to the immediacy and clarity with which a product commu-

nicates its value, and to interfaces that operate as if they were an extension of the user's own intuition — i.e., they do just what I expect them to do.

Tyson's vision of making a "power shift" is communicated through distinct language and metaphor. "Metaphor is critical. It's a way to reach when other language becomes ineffective." One of Tyson's injunctions is simply to "stop it," a statement that is made in relation to old self-defeating behavior and not yet having accepted responsibility. "Stop selling" is another variant. "In design, the thing we usually spend our time on is selling — selling the value of the function. But what happens if you are actually in control? What happens if — instead of going out with a tin cup, or chasing golden doors — you go to the same meeting and you say, 'No, you don't understand. I'm not here to get money. I'm here to invest in your future?' Tyson has struck the words "client" and "selling" from the CDG vocabulary. Instead, he says, "Thous shalt use the word partner. Try lining that up with the tin cup! It doesn't. Partner lines up with investment."

In Tyson's view, "design is the whole thing," and "the solution is the whole product." Value is created through designing a holistic solution, something that can only be achieved through making holistic jumps, not by inching forward. This requires a multifunctional team that operates holistically, and the willingness to "backcast" rather than forecast. "Success comes not from the fact that we create a team of functionally excellent people. The functions and our principles are just the ingredients. Success comes when people stop contributing simply from their functional excellence, and instead own the whole design which in turn creates the whole product."

The team that operates holistically will be comfortable with backcasting. "Forecasting is a linear process of extrapolating forward. It is analytic, and past a certain point, analysis becomes dysfunctional; besides, no amount of analysis will give you an answer. You can't get there from here." "Just keep on going" might work for the Energizer Rabbit — one of Tyson's metaphors — but it won't work for product design. While today's platforms pay the bills, future value cannot be created by simply building on past platforms. Alternatively, there is backcasting, or postulating future power shifts and interpolating back to the present. "You find that if you jump to the future and then work your way back to the present, the solution will be different than if you tried to start in the present and kept moving forward. Interpolating from future to present changes your viewpoint, and you can get a much clearer picture of the strengths and weaknesses of your present product design." That is, creating power shifts in user value requires a concurrent power shift to holistic thinking and holistic team process.

JOHN
TYSON
VICE-
PRESIDENT,
CORPORATE
DESIGN
GROUP



350 PHONE
SITS AT AN
ANGLE FOR
GREATER
READABILITY
FROM A DISTANCE,
AND FROM
DIFFERENT
VIEWING ANGLES



CHALLENGE

The president of Northern's biggest customer pointedly challenged NT/BNR in mid-1992 when he said that "I can't create market pull with your products because they look like yesterday. If you can't respond, I may have to look elsewhere." His ultimatum confirmed what NT knew but hadn't yet wanted to admit to itself. John Tyson, newly appointed vice president of NT's Corporate Design Group (CDG) welcomed the telco challenge as an opportunity to create a "discontinuity" in the product line — i.e., to create a "power shift" to another level of value. During this same period, CDG members had become increasingly dissatisfied with the "safe," unremarkable designs of two phonesets, most of whose design and mechanical development work was already done. Although Bell Canada had signed up for one (the Vista 250), CDG people did not feel that either terminal delivered adequate customer value, or that either could become a platform for the future. CDG was the first to say unequivocally that the design for the ADSI terminal was "broken."

RESPONSE

A few weeks later, CDG and its BNR and NT partners formally said "No" to both of these phones, and proposed that the two, which had been on separate development tracks, really belonged together as a product line. The multidisciplinary ADSI team went off-site for 10 days to develop a counter-offer. During the first week, they intensively explored and articulated key user values, and during the second, they experimented with alternative ways of capturing those values. They focused in on a concept of replaceable modules in a common, hands-free 250/350 base. The 250 module would feature caller identification, call-waiting identification, a directory, and a caller's list. The replaceable, interactive, 350 ADSI modules would have a larger screen display for more sophisticated transaction services, such as home banking. After the off-site, the team quickly secured support from Tyson and terminals development, and in a few weeks, from upper levels of product management and other stakeholders.

BACKGROUND

Analog Display Services Interface (ADSI) is a protocol, initiated by BNR, that allows residential users to accomplish interactive transactions through an analog device (i.e., a phone) that has the right interactive capabilities. NT not only had to develop such a terminal, but it also had to orchestrate a complex partnering and lobbying process that would make the protocol a standard.

For nearly 20 years, BNR had three design groups — Industrial Design, User Interface (formerly Human Factors), and User Needs Assessment — housed within Design Interpretive. DI's work had become increasingly reactive, and depended on each group's getting its own subcontracts from the business units. Late in 1991, the position, charter, and visibility of design began to change dramatically

with Tyson's appointment. The design group, designated a corporate center of excellence (CoE), would now report directly to the president of BNR, and Tyson would be a member of his cabinet. Tyson and his senior managers undertook an intensive self-assessment that led to a "reset" and renaming of the function.

CENTER OF EXCELLENCE

Tyson's concept of CoE revolves around vision, accountability, value, and leadership. Peter Trussler, director of CDG, notes, "When you're operating as a center of excellence, you don't wait for someone else to create a vision that you respond to. You create the vision. You bring value to your business partners." CDG makes itself accountable for bringing design leadership, product continuity, and customer value to the entire NT family of products. To effect this, Tyson believes that achieving functional excellence is not enough; CDG must also operate around an intersecting axis of new product creation and leadership. Design leadership means identifying and conceptualizing opportunities that cut across all product-line platforms and across existing business units, products, and boundaries. This charter had implications for both the funding and organizational structures that were shaped during the reset process. Tyson observes, "If we were going to create a power shift, then we had to address the funding structure. The funding must support the concept. So I challenged the organization from the standpoint of my accountability." As a result, Northern got rid of the subcontracting relationship and established a corporate-funded CDG investment budget.

RESET: REPOSITIONING DESIGN

These CoE concepts became embodied in corporate policy regarding CDG. A carefully crafted one-page document, which Tyson refers to as "just a hunting license, but you've got to have it," the policy validates CDG's status as a corporate center of excellence driving design excellence and continuity across all NT products. The policy also recognizes CDG sign-off authority at Gates 0-4 of the new product introduction process, and sets up a Corporate Design Council of top corporate and operating management to ensure product continuity and Corporate Design's alignment with corporate objectives.

The next three steps of the reset were funding changes, corporate thrusts, and a new organizational structure. The thrusts are the focal points/processes for defining future value/product space of the corporation. Currently there are five such CDG-led horizontal thrusts cutting across the existing product/business silos.

Structurally, the reset has led to organizing CDG around the two axes of excellence and leadership, and dynamically, to building its leadership capabilities from the interplay of its multifunctional teams. CDG is both a multifunctional entity and a single integrated entity. This duality is represented in its multifunction teams, which are headed by a product design manager (PDM) who acts as a single-point interface with BNR and NT partners, and is responsible for delivering product leadership for particular product line(s).

LEVERAGING DESIGN

Together with the corporate thrusts, the final step of the reset is CDG's response to the chairman's belief that the design function is a corporate competency that could, if properly leveraged, contribute



TESTING AND
CUSTOMER
REQUIREMENTS
LED TO THREE
COLORS:
ALMOND,
CHOCOLATE,
AND SEA
BLUE-GREEN.

significantly to Northern's competitive future. CDG has set target ratios that dramatically reconfigure how it deploys its own resources: from 80% sustaining platforms to 80% new-generation and vision platforms. By choosing how it will invest in its development partners' programs, it hopes to influence the investment of its partners' new-generation and vision platforms. As Trusser describes it, "Tyson ultimately determines where to invest our resources. He looks at where we can bring leadership to discontinuity. At meetings, he will tell our development partners, 'I'm interested in investing X amount in your business.' Their response is, 'Why aren't you investing more in my business?'" Top management in NT and BNR has made future-oriented R&D investment a top priority, and all the business units have been scrutinizing and shifting their own resource deployment.

REDEFINING THE PRODUCT CONCEPT

Following the reset, Bruce Tsuji became a PDM whose responsibilities included the ADSI and 250 phones. While he had not been very comfortable with the definition of the ADSI handsfree, "the overall definition of the product really wasn't my job when we were in a service mode. Now I had to question whether this was a product that could take us into the future." He concluded that it was not, and CDG convinced development and product management to declare that the old definition was broken. Development sponsored a 10-day off-site meeting of the multidisciplinary ADSI team. What was unusual was that the team had the opportunity to define the concept itself, rather than beginning work in Phase One when the product definition had already been set. They received research input from several sources; what was unusual was that it was about

basic user needs rather than comparisons among products already in the market. Drawing on the research, their own experience, and intuition, they had intense and wide-range discussions about user value. These discussions were the foundation of their reconceptualization of the product. Team members were enormously energized and felt greatly empowered by the experience. They felt the most

important things about the process were that they themselves got to define the concept, that they were creating something of value, and that "we talked about things outside our field — like user value."

350 MODELS
SNAP IN AND
OUT OF THE BASE.



DESIGN TO VALUE

NT, whose core business is switches and networks, must be in the terminal business because terminals are the vehicle through which the intelligence and services of their customers' networks are tapped. As Tyson notes, "terminals are the dashboard for driving down the information highway." The thrust of CDG's value-creating activity is to give users easy access to network capabilities by designing its terminals according to its guiding design principles, and according to user values in a particular problem space.

Through its own internal, iterative process, CDG has identified three core design principles which now guide its design of all products: profound simplicity, conspicuous customer value, and self-evident operation. These principles represent a way of articulating CDG's value to the corporation, as well as a way of delineating the distinctiveness that CDG anticipates bringing to all NT products. CDG designs to these principles. It also designs to the more-specific values of end users that are identified for a particular problem space.

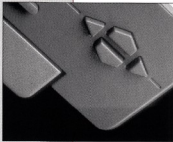
The key user values identified by the ADSI team were flexibility and leveraging investment. These same values are also critically important to the telcos, particularly in Canada, where over half of subscribers lease their phones. The team's answer to both of these values was modularity. This approach protects and leverages customer/user investment in the base module, while keeping the overall product flexible and open to future technology and service developments. And, by locating basic telephony and personalized features in the circuitry of the base, the designers have made it easy for users to replace modules without having to lose their directory's customization.

Although an early prototype of BNR's ADSI test phone met Bellcore's display standards for an ADSI phone, usability test trials showed that users were not satisfied. Many never discovered the three "hidden" softkeys, and those who did disliked continual scrolling to identify all six softkeys sequentially, as well as to refer back to other information. CDG concluded not only that the 3x22 display was too small, but that its limitation was so critical that the original design was broken. The design was neither self-evident in its operation, nor simple enough to learn, nor easy enough to use. The team concluded the ADSI phone must have a much larger screen (it is now 8x21 characters) and that all softkeys must be visible at all times. The display module is the single most expensive part of the phone, and is a considerable fraction of its cost. The new CDG design principles guided the rejection of the original product offer, and the design of the new one, despite the incremental costs. As Tsuji notes, "User value guides our product concepts, how we design the product, and how we make trade-off decisions. We decide on the basis of the user."

The 250/350 phone brings commercial-quality, hands-free audio into the residential market. How was this value to be made conspicuous and self-evident? By making the speaker phone prominent in the design, and locating a large, hands-free button on or near it and altogether separate from the other buttons. Initially, this led to some designs that went too far in the "conspicuous" direction; although test subjects liked its simplicity, the round speaker seemed to have migrated from an audio shop. Several variants of a half-round kept the intuitive feeling of its



SOFTKEYS
DECOUPLE
PHYSICAL
BUTTONS
FROM THE
LABELS ON
THE SCREEN.



SELF-EVIDENT
CURSOR KEYS



HANDSFREE BUTTON
IS CONSPICUOUSLY
LOCATED BY ITSELF
AT BASE OF
SPEAKER PHONE.

Vista

250/350

TEAM

CDG MODULAR

DESIGN TEAM:

TOP ROW (L. TO R.):

TONY LANGMEIER,

FRED TRASHKINS,

JOHN TOSIN,

PETER TRUSTEJA

BOTTOM ROW

(L. TO R.):

NESTA TAVAS,

BRUCE TSAI,

DESMOND ROSE,

CLIFFORD ROAD,

ERIC DYME

ASSIST:

MICHA BISHOP,

PATRICIA BRIDGES,

MARILYN FRENCH -

ST. GEORGE,

PAUL KINGS,

NORM LADOUCEUR



intended use, but were still too prominent. Designer Cliff Read notes, "Then we tried to see how small we could make it without losing the qualities." The final result is immediately eye-catching and communicates its use, but is smoothly integrated into the base. CDG argued long, hard, and, eventually, successfully, for the large, standalone button. Read notes, "The button is our icon of conspicuous user value. It could easily have been lost if we hadn't believed so strongly in it, and our management hadn't supported us."

PROFILE OF DESIGN

Design was renamed the Corporate Design Group in April 1992. Reports to president, BNR, and Tyson is a member of his cabinet. Based in Ottawa, CDG also includes a small group in Harlow, U.K. that does its own projects for BNR/Europe. CDG groups are:

- User Requirements and Design Evaluation: identify target product requirements - 10
- Interactive Design and Visual Interface Design: design user interface software and hardware - 15 in Ottawa, 7 in U.K.
- Industrial Design and Graphic Design: design the product solution - 9 industrial designers in Ottawa, 4 in U.K.; 3 graphic designers in Ottawa
- Mechanical Development and Transfer Prototype Development: optimize engineering and manufacturability - 15 mechanical designers; model shop