Organizational Change through Human-Centered Product Development

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A B S T R A C T

Using an ongoing systems design project, I explore how interaction design, rooted in a human-centered design process, changes not only the "look and feel" of a particular document but also transforms the organizational environment in which this product is embedded. The findings point to a new role of design within an organization.

I N T R O D U C T I O N

Traditionally, an organization was said to have three possibilities to introduce change: through its people (either through turnover, training or learning), via its structure (formal or informal, hierarchical layers, workflow), or by means of its tasks (number and kinds of actual tasks to be performed).[1] Interaction design may offer an alternative approach, but the implications of human-centered design on the organization and its product development process have not been studied at this point. Based on an ongoing systems design project, this paper explores how interaction design, rooted in a human-centered design process, can change not only the look of images and words of a particular document but also transform the organizational environment in which this product is embedded.

Every design process has as its outcome a product. Therefore it may be said that product design is the development of a product or vice versa, to development of a product is product design. Historically, design has concerned itself with aspects of the look and feel of two-dimensional symbols and three-dimensional things. But over the last few decades, design has moved into designing actions and environments.[2] This development has led to a re-evaluation of the product concept. For our purpose, Victor Margolin offers the most useful definition. He defines a product as "the human-made material and immaterial objects, activities and services and complex systems or environments that constitute the domain of the artificial."[3] According to this definition, an organization can be a *product* in its own right. This opens the door for product development to leave its organizational corner and move into the core of the organization.

Organizations, like any system with "humans in them," require design thinking and methodologies that are different from those applied to mechanical systems or "systems without humans" according to Churchman.[4] Goffman summarizes the challenges involved in designing for "systems with humans in them:"

> "Some parts of the body cannot be replaced, and not all physical disorders can be corrected. Further, due to medical ethics, a physician cannot advice a patient to junk the badly damaged or very worn object his body may have become (as can those who service other types of objects), although the physician may tacitly give such advice to other interested parties."[5]

In many ways, an organization is similar to a living body. As Goffman points out, it is much easier to fix a mechanical object for which replacement parts can be identified, isolated and replaced without having an impact on the overall system.

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[1] These three approaches happen to correspond with the three major management models identified by Mauro F. Guillén in *Models of Management,* University of Chicago Press, Chicago, 1994.

[2] Richard Buchanan traces the evolution of design in his article Rhetoric, Humanism and Design in *Discovering Design.*

[3] Margolin offers this definition in the introduction to his book *Design Discourse – History, Theory, Criticism*, University of Chicago Press, Chicago, 1989. His view broadens the definition proposed by Ulrich and Eppinger (1995), that a product is "something sold by an enterprise to its customers" and goes beyond the more recent characterization of a product by Cagan and Vogel (2002) "a device that provides a service that enhances human experience, always part of a company that provides service to its customers."

[4] Churchman, C. West, *The Systems Approach*, p. 10.

[5] Goffman, Erving, *Asylums and other total Institutions*, p. 299.

In the past, designers and organizations have tended to treat products as systems in themselves.[6] Like a brochure on its own can constitute a beautiful system in the way it applies one logic to all its parts (the layout grid, the typeface and images or illustrations, etc.), organizations are apt to have their own "inner" logic. This logic is expressed in rules and procedures that make perfect sense to the people who created it but are incomprehensible to its customers and employees. People who interact with the organization on one level or another do not distinguish between products and services provided by the organization and the organization itself, as Vince Robinson has found:

> "They [the users] do not readily distinguish between the policy settings of the system (the determination of what they must do and what they are entitled to expect), the legislation that gives legal support and expression to those policy settings, the administrative arrangements set up for the system, the brochures and guides that explain the system, the forms that need to be filled in to access the system or the notices they receive and to which they may need to respond."[7]

Human-centered design distinguishes itself from other product development methods by its emphasis on user research. It ensures the success of a product by actively involving the people for whom the design is intended at every stage of the process, from the conception phase to the final prototype. The techniques used in human-centered design include conducting interviews, observing people in their environment, learning about shortcomings of current products, and immersion, which puts the designer into the place of the user's current environment. Users get to test prototypes early on and thus provide important feedback during the development phase.[8] Human-centered design is at the core of interaction design.

Interaction design is fundamentally about how people relate to other people and how products mediate those relationships.[9] Following this path of thought, products inherently possess qualities that shape the relationships among people. When some of these qualities change, the mediated relationships can be expected to change, too. In the organizational context, interaction design offers the opportunity to design desirable relationships for people both inside and outside the organization, using product development as the vehicle to shape these relationships and ultimately the organization itself.[10] How interaction design might carry out this task is summed up by Buchanan:

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[6] Noticeable design exceptions are Henry Dreyfus and Charles & Ray Eames who emphasized the importance of product contexts. Organizations like Apple Computers, Starbucks or Siemens AG are examples of companies that consider each product to be part of a larger system. Among design theorists Victor Margolin, Herbert Simon and Bruce Archer have repeatedly pointed to the systems nature of design.

[7] Vince Robinson, First Assistant Parliamentary Counsel at the Office of Parliamentary Counsel of Australia [M:\WWWROOT\OPC_GOV_AU\PLAIN\DOCS\REWRITING.DOC] [26 Nov 2002]

[8] Bruce Hanington provides an overview of research methods for human-centered design projects: Methods in the Making: A Perspective on the State of Human Research in Design, Design Issues, Volume XIX Number 4 Autumn 2003.

[9] The definition of interaction design is still disputed among practitioners and theorists. Many consider interaction design to be the design of man-machine interfaces. I follow the much broader definition by Buchanan. Richard Buchanan, Management and Design: Interaction Pathways to Organizational Life. Forthcoming.

[10] Powell explains, how the "appropriate form" of an organization emerges from the interaction of an organization with its constituents. Powell, Walter W, 1991, Expanding the Scope of Institutional Analysis in *The New Institutionalism in Organizational Analysis*, Powell, Walter W., DiMaggio, Paul J. (ed.), Chicago, IL: University of Chicago Press, pp. 183-203.

> "Interaction design suggests that we shift our perspective from the massive totality of the system to the pathways of individual human experience – to our major pathways through the city and through the organization to accomplish our goals."[11]

C A S E   S T U D Y   &   M E T H O D

I will use the first phase of the redesign of the United States Postal Service (USPS)[12] Domestic Mail Manual (DMM) as a case study to illustrate how the human-centered redesign of an organization's core product can change an organization's relationships with its own employees and with its customers.

Borrowing concepts from graph theory and social network analysis, I will map out the pathways available to customers and employees who want to obtain information from the DMM. The network in this case includes the different user groups made up by customers and employees, the DMM, experts of the DMM, and, on the customer side, also mailing service agencies and mail suppliers.

I am comparing three different situations: First, I look at the pathways the DMM 57 offers to customers and employees. Next, I map the projected pathways after the completion of the DMM Transformation Project. Finally, I take the first completed part of the project, the DMM 100, which is aimed at the household mailers, and compare the pathways with the projection and the pathways of the previous DMM.

I expect the graphs to show a clear shift in the interaction among members of the network due to the human-centered redesign. Of particular interest is the issue of centrality within the internal and external network of the USPS, as this provides an indication of the structure of the organization itself. My focus will be on who takes on a central role in the USPS network at the beginning of the project and on how their centrality changes.

T H E   D M M   T R A N S F O R M A T I O N   P R O J E C T [13]

The DMM is the key to the USPS delivery services both for its own employees and for its customers. Physically, it is an overwhelmingly large binder that contains every applicable rule and regulation detailing what one can mail and how one can mail something. It also describes each class of mail and every mail related service the USPS offers. The DMM is maintained by the Mailing Preparation and Standards Department at the USPS headquarters

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[11] Richard Buchanan, Management and Design: Interaction Pathways in Organizational Life.

[12] The United States Postal Service (USPS) is the eighth largest organization in the United States with a career work force of 800,000 people. Its products and services anchor a $900 billion domestic mailing industry, which in turn employs nearly 9 million Americans.

[13] The DMM Transformation Project is an ongoing project by USPS and the School of Design at CMU directed by Professor Richard Buchanan. This paper uses data from the first completed phase, the *DMM 100: A Customer's Guide for Household Mailers*. Currently, the design team is working on the *DMM 200: A Guide to Mailing for Businesses & Organizations*.

in Washington, D.C. Most members of this department have been drawn from post offices nationwide because of their expertise in a particular subject area of the DMM.

Over the 226 years the USPS has been doing business, the DMM evolved into a tome only internal and external experts could penetrate. Even among USPS experts today, disagreements arise about particular interpretations of terms. Few mailing customers have unrestricted access to it; many, especially household and small business mailers, do not even know of its existence.[14]

Any change in a complex organization like the United States Postal Service poses an enormous challenge. The USPS is equipped with all the weaknesses of a large bureaucracy; it is difficult to begin even the tiniest transformation process.[15] Long-term employees enjoy a high level of job security and therefore have little incentives to participate in a change.

Others are convinced that the way they are doing things is the one and only right way and only they could possibly know what is involved in the task. Carley and Harrald (1997) hint at the paradox of learning and promotion in organizations: The more experience and skills employees show, the more they get promoted. And while the organizational performance overall improves, individual behavior and actions become more rigid and more difficult to change.[16]

Similarly, some external partners of the USPS have become powerful advocates of their own interests, and a change in the way business is being done is not welcome by all.[17] Many of these companies have been surprisingly successful in maintaining idiosyncratic business practices. These businesses limit their commitment to USPS Standards to patiently filling out government forms but show little enthusiasm to maintain a common service standard. This is in line with DiMaggio & Powell's implicit lesson that bureaucratic homogenization in organizational structure and connectedness do not mean less chaos.[18]

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[14] Customers were charged $50 to obtain their own copy or had a chance to ask to look it up in a post office.

[15] As one of the USPS executives noticed, "People who work at the post office just don't like change. Period."

[16] Carley, K. and Harrald, J. R., "Organizational Learning Under Fire: Theory and Practice," in *American Behavioral Scientist*, 40, 3, pp. 310-332.

[17] Mailing service agencies, direct mail services, meter providers, online service providers, PC Postage, etc. all struggle with their new role.

[18] DiMaggio, Paul J. & Powell, Walter W. 1983. *"The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields"* American Sociological Review 48 (April). pp 147-60; reprinted in IOA.
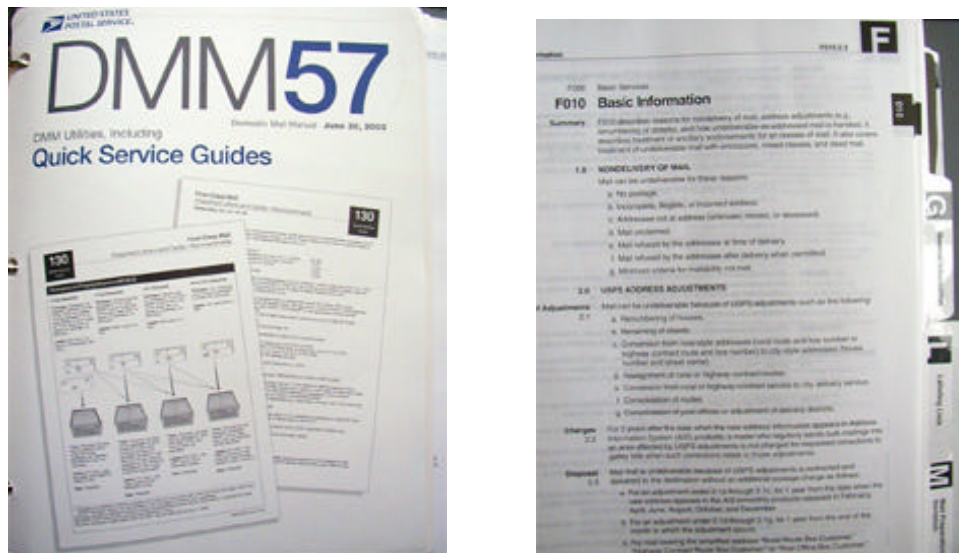
Picture 1: The cover (left) and a sample page (right) from the DMM 57. Text-heavy layout, difficult terminology and topical organization require the reader to possess upfront knowledge about mailing to find the relevant passages in this rules book.

By requiring expertise in the interpretation of legal and technical documents, the DMM has unwittingly created expert zones that ensures both the demand for internal DMM experts and the demand for mediators between the USPS and its customers who could not invest time and other resources in trying to figure out their way through the DMM maze. As a result, the interaction between the organization and its customers was one of administering and enforcing rules.

1) Before the DMM Transformation:
Centrality of Experts, Focus on High Volume Customers

The DMM experts became aware of the need to ease general accessibility and made many attempts to alleviate the situation. A whole range of colorful "children documents" emerged, small publications that addressed a particular topic of the DMM. A lack of understanding the perspective of someone unfamiliar with the DMM terminology and a trained inability to view the DMM as anything other than a rule book contributed to a continuous disconnect between these experts and the constituents they served. Despite their best efforts, the children documents contributed to customer's confusion and kept them relying on experts.
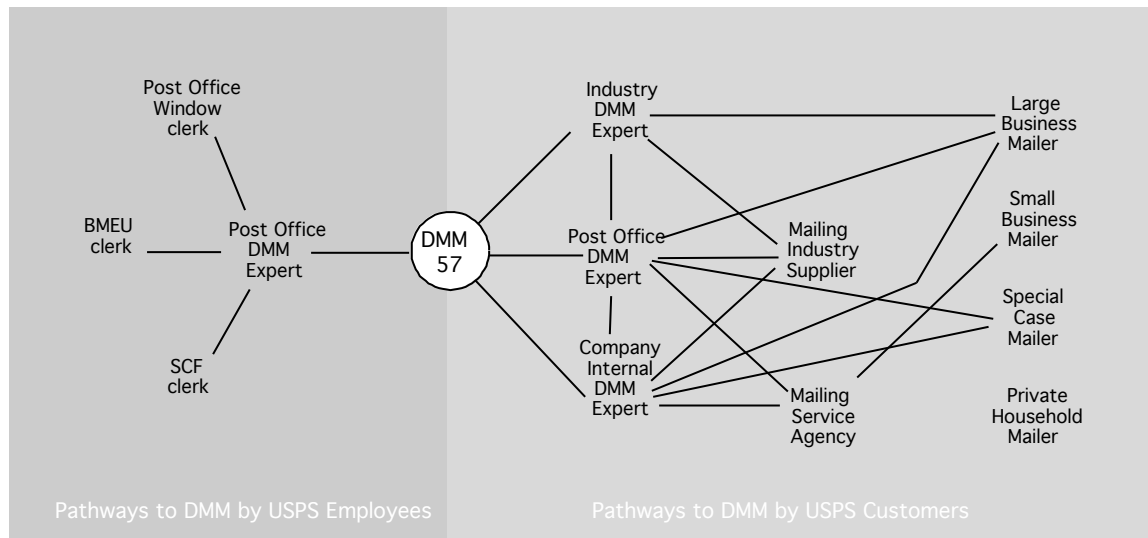
Graph I: This graph shows the paths employees (left side of graph) and external customers (right side) typically took when they needed information from the DMM 57. The experts occupied a key position, enjoying both centrality and a gatekeeper function. Private household mailers had no access to the information, and small business mailers sought their information from mailing service agencies, who in turn had access to internal and external experts.

Graph 1 shows the relationships the old DMM (known as *DMM 57*) encouraged among their customers and employees. DMM experts hold the key to the information vital to mailing services. Their role is central on both network sides, internally and externally. None of the customers and none of the lower ranked USPS employees have direct access to the core knowledge.

Non-experts rely on the experts out of fear of misinterpretation or missing a crucial term that could cost them or their company a lot of money. Experts thrive on the document's problems, priding themselves in navigating difficult terrain and gaining respect from the people who seek their advice. They function as gatekeepers who facilitate decision making because the DMM 57 itself offers no decision-making tools. The organization may be said to be expert-centered, but not human-centered.

2) DMM Transformation: Towards a Human-Centered Organization

Through user research four key user groups have been identified for the DMM: Household Mailers, Small Business Mailers (low mailing volume), Large Business Mailers (high mailing volume) and Mailers with Special Concerns (such as mailing a queen bee or a blood sample). To accommodate their different needs and to appeal to their various expectations in terms of content and detail, the redesigned DMM has been sectioned into four separate modules: the DMM100 addresses concerns of the everyday mailer, the DMM 200 introduces businesses to the commercial services of the United States Postal Service, the DMM 300 talks about automatization and optimization of mailing procedures for established business mailers and the DMM 400 finally offers guidance for uncommon mailing needs.
Each brochure functions as a complete stand-alone document for the respective customer but together with the other brochures forms the DMM system.

Internal employees and stakeholders were identified as yet another user group. The challenge to the redesigned DMM is to fulfill their requirements as well.
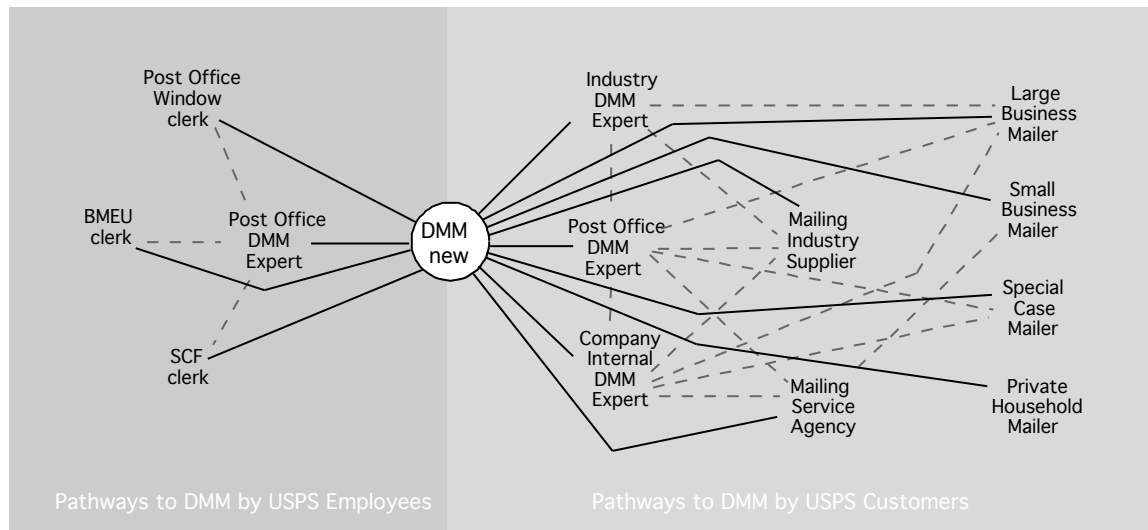
Graph II: This graph shows the four distinct user groups that have been identified via human-centered design methods. The goal of the transformation project is to provide each of these customer groups with the DMM information that is important to their respective situation in a language they can understand. Instead of relying on experts, they will have access to expert knowledge themselves. It is important to see that the redesign also aims to change the pathways for USPS employees and thus reaches into the periphery of the organization itself.

Graph II shows the projected pathways of interaction for employees and customers once the DMM Transformation will be accomplished. Experts will no longer play a central role inside or outside the organization since the knowledge they have painstakingly accumulated over the years is now easily available to everyone who is interested. At the same time the DMM becomes a proxy for the USPS organization, the overall interaction between the USPS and its customers is one of direct communication.

3) The DMM 100: A Successful Shift

Graph III shows that a shift has occurred both internally and externally, reducing the centrality of the experts and integrating people into the system who were not part of it before. The old document, the DMM 57, did not offer any pathway for the household mailer who typically is not familiar with mailing terminology (compare *Graph 1*). The DMM 100 addresses for the first time the needs of this user group and provides access without expecting customers to know technical terms or mailing procedures. The information in the brochure has also been found relevant to some small business mailers.

The DMM 100 includes decision-making tools and puts these tools into the hands of those who make the decisions. Therefore the gatekeepers lose one of their key functions. Both customer groups no longer depend on an expert to weed through their choices and to find out about requirements for a particular USPS service. Instead they have access physically, cognitively and emotionally (empathetically may be a better word in this context) to the DMM itself as the DMM 100 addresses their concerns and questions in a familiar language

following a pathway that mirrors their personal experience. Unlike the DMM 57, the DMM 100 is available to USPS customers for free in most post offices.
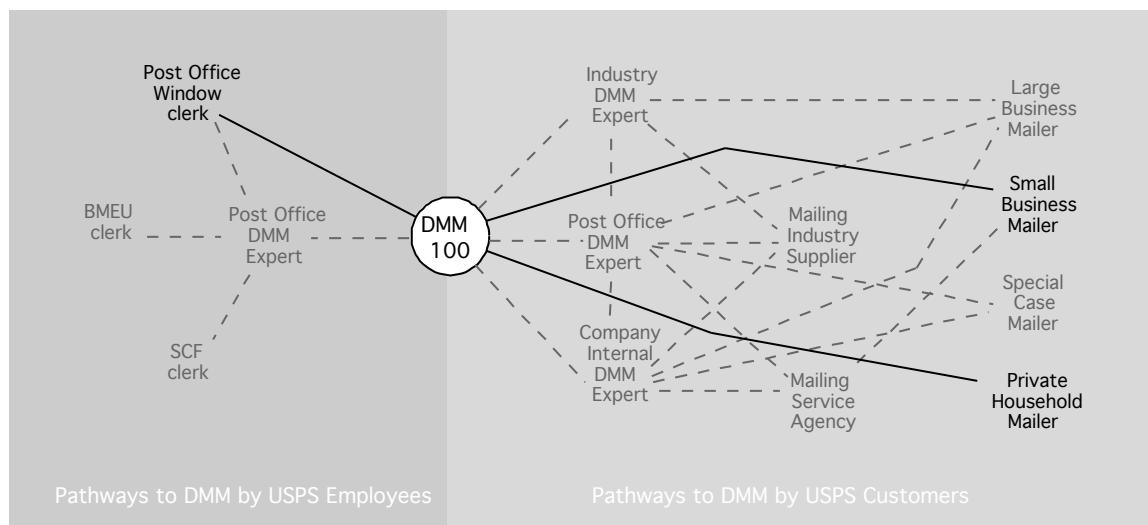
Graph III: Even though the DMM 100 addresses primarily the concerns of household mailers, the information has been found to be of value to small businesses as well. This explains the link between small business mailers and the DMM 100. The role of experts has become secondary on both sides of the chart. They no longer represent the gates to mailing knowledge. Thus their role is no longer as central as it was with the DMM 57.

The reduction of status for experts and the empowerment of ordinary people through education reflect a significant change within a traditionally hierarchical organization. The organization has – for now only in respect to this user group – shifted from an expert-centered to a human-centered structure. Again, it is important to point out that this shift has ripple effects through the organization as new employees, too, can now quickly become "experts" and "equals."

4) Findings

By putting the tools for decision-making into the hands of those who make decisions, the DMM project has altered the relationships and the kinds of interactions among the members of this network. In their analysis of the Hawthorne studies, Roethlisberger and Dickson[19] point out that workers are more productive when managers take an interest in them and when they feel involved and integrated into the life of the factory. Human-centered design with its focus on user research and participation of users and other stakeholders in the design process is a means to involve people actively and to contribute to their sense of integration.

By making the rules and regulations available in a user-friendly and human-centered manner, the USPS empowers its customers and employees. This approach that respects the customer

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[19] Roethlisberger F. J., and Dickson, W. J., 1934, Human Relations in *Management and the Worker,* Harvard University Press, Cambridge (reprinted 1970 in *The Sociology of Organizations*, O. Grusky and G. A. Miller (ed.), The Free Press, New York.

as well as the lower-ranked employee as an intelligent human being able to make his or her own choice, is a clear departure from the previous approach of this organization.
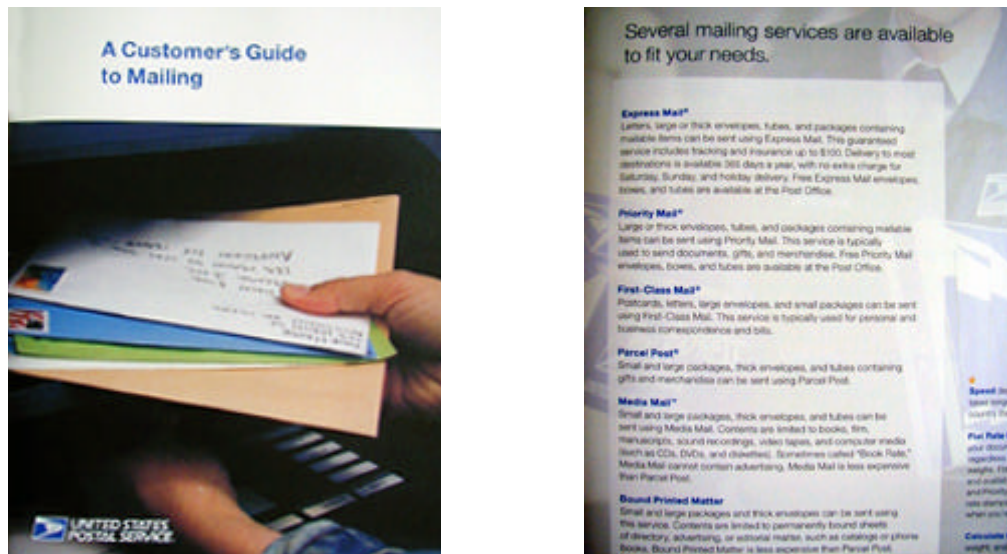
Picture 2: The cover (left) and a sample page (right) from the DMM 100. Content, language and visuals are directly aimed at the need of household mailers but also serve as educational tools for window clerks who have to respond mostly to household mailer questions. The reader is not expected to have any knowledge of terms or procedures.

C O N C L U S I O N

Taking the DMM Transformation Project as an example, I explored how a human-centered design approach may change not only the look of images and words of a particular document but may also transform the environment in which this document is embedded. It appears that a human-centered design approach is a potentially powerful tool for organizations who seek to change their customer relationships. More importantly, perhaps, is the possible impact this design approach can have inside the organization. If an organization can be viewed as a designed product, organizational design can be seen in a new light. The processes of product development take on a new significance in the context of organizational theory and in the management of organizations. It would allow the study of organizations from a design perspective.

For an organization, human-centered design offers two key benefits: Firstly, it centers product development on the needs of its customers. Secondly, applying user research methods can reveal the strengths and weaknesses of an organization's interaction with different customers and employees. The findings can serve as a base for an organizational redesign by understanding existing and future relationships within the organization's network from a user perspective.

In the larger context of systems design, the DMM Transformation Project points to an existing link between human-centered design and organizational learning. Interaction design offers choices to communicate knowledge and educate people about procedures and

standards. It can help identify the troubles of current communication approaches and move an ingrained system to explore and even endorse alternatives.

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