

A MACROERGONOMICS PERSPECTIVE ON CUSTOMER INTERACTION CENTERS

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Abstract: Customer interaction centers (contact or call centers) are a relatively new but increasingly widespread form of technology-enabled work organization. From simple call centers charged with routine service work, customer interaction centers are evolving into multimedia-enabled customer relationship management centers that are tightly linked to the rest of the firm with enterprise application software. The introduction of ICTs into the firm's service and office functions is leading to a form of work (which we call electronic work, or "e-work") that poses many challenges to those who would manage technological change to improve work performance and well-being. The costs of organizational learning to use highly integrated work systems are known to be very high. Moreover, the increasingly strategic nature of customer contact requires a clearer understanding of the factors that determine performance and service quality in customer interaction centers. In this article we develop and apply a macroergonomics perspective to customer interaction centers. Macroergonomics as a discipline is concerned with the analysis, design, and evaluation of work systems. Macroergonomics seeks to create a fully harmonized or balanced work system through design of the overall work system as well as through design of individual jobs and human-machine and human-software interfaces. The application of ergonomics principles to work in customer contact centers has mainly focused on the physical aspects of the office environment. In this article we develop an analytical framework based on Carayon and Smith's Balance Theory, which identifies five elements of balanced work systems: the environment, the task, the technology, the organization, and the individual. We review the evidence concerning the design of customer interaction work systems in the light of these five elements and identify factors known to affect wellbeing and performance in transaction oriented and relationship oriented customer interaction centers.

Keywords: macroergonomics, contact centers, customer interaction, customer relationship management, work organization, occupational health and safety, service sector, job design, stress

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“Despite the raft of technology that purports to ‘empower’ agents by reducing the repetitive, annoying calls and increasing the amount of ‘knowledge work’ they do, [in 2005] call centers will still be staffed by an overworked, transient staff with little chance of promotion to a career track.” Keith Dawson, *Call Center Savvy. How to Position Your Call Center for the Business Challenges of the 21st Century*, 1999.

Introduction

Customer interaction centers (contact centers or call centers) represent a relatively new and increasingly widespread form of technology-enabled work organization – a kind of ICT-enabled remote service delivery work that we call e-work. It is estimated that in North America, between 1.5M and 1.8M people are employed in nearly 60,000 contact centers (IDC, 2003). Electronic customer service work poses many challenges to those who would manage technological change to improve work performance and worker well-being. Technological change is enabling major transformations of the customer service function. From simple call centers charged with routine service work, some customer interaction centers are becoming multimedia-enabled, artificial intelligence-enhanced, multi-channel customer relationship management centers that are tightly linked to the rest of the firm with enterprise application software, driving business processes and workflows in the back office. Contact centers can emphasize different mixes of transactions or relationships with customers. At the same time, customers’ service expectations are increasing, and many customers believe that service is deteriorating across the range of touch points. They report irksome service encounters with self-service machines, unqualified human service providers, dysfunctional websites, harried customer service representatives, or aggressive telemarketers.

Many contact centers jobs are undesirable, as is evidenced by high reported rates of employee absenteeism and annual employee turnover rates of 35%-50% in U.S. customer contact centers. In service encounters, the employee’s job satisfaction is a major determinant of service quality (Varca, 1999). Many of the job and work system designs in the contact center industry have been driven first and foremost by considerations of service delivery cost. Labor is the largest cost component in the operation of a contact center, and since these centers can be located practically anywhere that communication infrastructure and labor conditions permit, the rate of establishment of centers in low-wage countries such as India or the Philippines is very high.

The increasingly strategic nature of customer contact requires a clearer understanding of the factors that determine performance and service quality in ICT-enabled customer interaction centers. In this paper we develop and apply a macroergonomics perspective to such centers. The application of ergonomics principles to work in customer interaction centers has mainly focused on the physical aspects of the office environment. However, the psychological and social factors are equally important. We develop an analytical framework based on Carayon and Smith's Balance Theory of Job Design. We review the evidence concerning the design of customer interaction work systems in the light of the five elements of work systems proposed by the Balance Theory, emphasizing differences between jobs and work in transaction-oriented and relationship-oriented contact centers.

Macroergonomics and the Balance Theory of Job Design

Ergonomics is a discipline that applies “knowledge of human abilities and limitations to the design of systems, organizations, jobs, machines, tools, and consumer products for safe, efficient, and comfortable use” (Helander, 1997:4). The goal of ergonomics is to adapt as well as possible the human-made world to human beings’ characteristics (their abilities and limitations). Ergonomics seeks to design jobs and work systems that respect employees’ abilities and limitations in order for work to be a positive and fulfilling experience, one that does not take a psychological or physical toll and bring about job dissatisfaction, ill-health, decrease in performance, and turnover, for example.

The ergonomics/human factors field has grown through three distinct phases or generations: the first was the “knobs and dials” phase and the second one the “cognitive ergonomics” phase. Most of the work in the human factors field in these first two generations concentrated on job and task design and on individual interfaces with machines. The third generation of ergonomics, macroergonomics, is defined as “a top-down sociotechnical systems approach to the design of work systems, and the carry-through of the overall work system design to the design of the human-job, human-machine, and human-software interfaces” (Hendrick & Kleiner, 2002:3). In other words, macroergonomics seeks to create a fully harmonized or balanced work system through design of the overall system of work as well as through design of individual jobs and human-machine and human-software interfaces.

The macroergonomic approach can satisfy three basic criteria for correct work systems design and the related design of jobs and human-systems interfaces: to be human-centered, to apply a humanized task approach to function and task allocation, and to adequately consider the relevant socio-technical systems variables in terms of their implications for the design (ibid.). In sum, macroergonomics approaches emphasize the importance of focusing on the whole picture (the organization and its systems) and the need to make use of qualitative and quantitative methodologies to capture relevant data and information. Macroergonomics has high potential to effectively address the issues raised by e-work and integrated work systems, providing the ergonomist with a methodological approach and a set of tools that allow the analysis and understanding of the organization as a system.

The Balance Theory of Job Design offers a way to operationalize a macroergonomics perspective to identify and develop design parameters for individual jobs and their work systems. It was proposed by Smith and Carayon-Sainfort (1989) and is based in job design theories, occupational stress theories and ergonomics science. Balance Theory seeks to “improve motivation and performance and reduce stress and the negative health consequences by ‘balancing’ the various elements of the work system to provide positive aspects to counter the negative ones... all aspects of the job [are] considered in developing a proper design” (Carayon and Smith, 2000:656 and 657). The Balance Theory poses that the work system is made of five distinct elements: the individual, the environment, the task, the technology, and organizational factors. These elements interact to produce a “stress load.” Stressors can be physical as well as psychological or

social. Stress loads have biological, emotional, and behavioral consequences. The work system's elements have positive and negative aspects that produce the stress load on the individual performer of a job. It is the task of the macroergonomics researcher to identify the factors that produce or reduce stress and to 'balance' the stress load by reducing stressors or by increasing stress reducers. When some aspects of a job or work system are intrinsically stressful, the Balance Theory advocates "compensatory" balancing by reducing other stressors.

Originally developed to account for workplace physical stressors with implications for occupational health and safety, the Balance Theory has been extended to service work environments and even to multi-organizational or community environments. By permitting the work system designer to look at a very broad range of possible factors that affect quality of work life and work system performance, the Balance Theory provides a useful systems-level conceptual framework to identify sources of unhealthiness and inefficiency in work environments. Its attention to physical as well as psychosocial or occupational stress factors, and its normative commitment to worker healthfulness and job quality, stand in contrast to the business process re-engineering movement's single focus on efficiency as the principal goal of process design interventions. For these reasons we believe that the Balance Theory offers a potentially fruitful approach to the design of jobs and work systems in customer-facing environments.

Customer Interaction Centers and the Emergence of e-Work

Contact centers originated as service sites for inbound customer phone calls. Outbound centers originated later as telemarketing devices. These two functions are still largely separate in the contact center industry, and inbound customer service functions predominate in the majority of contact centers (CMP/CommWeb, 2000).

Technological change is having major impacts on contact centers and more generally on customer service. At their origin, call centers consisted of simply of phones on desks. By 1970 it was possible to have on-site switching through private branch exchanges (PBXs) and automatic call distribution (ACD) capability for call queuing and routing. Computer telephony integration (CTI), available since the 1980s, is a broad group of technologies that combines "real-time, person-to-company communication with a background of data that adds value to that communication" (Dawson, 1999: 81), putting deep data into the hands of customer service representatives as they interact with customers. Innovation in customer interface technologies such as interactive voice response (IVR) and speech recognition enlarge the range of automated self-service solutions that may be offered to customers. Web-enablement allows the service representative and the customer to jointly view web pages and converse together in audio and video. Value-based call routing enables service providers to select service interaction formats as a function of the value of the customer to the firm and the skill level (cost) of the service agent (Anton, 2000). Internet technologies and networked devices for remote data capture such as RFIDs open the era of the networked, multimedia customer interaction center, enabling multiple kinds of contact with customers and a wider variety

of services (including automated or customer self-service) to be managed and delivered remotely through an increasing range of touchpoints.

The challenges of customer service in this new technological environment are significant. Firms (and increasingly the public sector) must be able to respond to difficult-to-predict fluctuations of traffic across a range of communication channels with the appropriate kind and quality of service. Consistency of service quality requires data integration across company sections or units, media integration across communication channels, and contact history integration across the customer transaction cycle. Customer intelligence management capability plays a strategic role in the selection of the right mix of human, automated, and self-administered services offered by a firm, and a critical functional role in triggering the right response at the right moment.

Work in such an ICT-enabled customer service environment involves the use of multiple computer and communication tools. Interacting with the customer on the phone, or over the Internet, or via e-mail, the agent will use the firm's computer system to place an order, check availability and delivery, and update customer information in the internal database, which is linked in real time to the corporate enterprise system. Agents must master information, multi-task, take decisions, manipulate data with no errors, present a pleasant face to customers, and process work quickly while being monitored by managers.

Furthermore, the greater the degree of integration of interaction capability across the customer transaction cycle, the more likely it is that agents will be involved in cross-selling and up-selling as well as in handling incoming communication. The business goal of Customer Relationship Management (CRM) is to increase the lifetime value of the customer to the firm through discovery of ways to bring value to the customer, while offering less costly services when appropriate and deflecting or de-marketing undesirable customers. Although the contact industry frequently refers to its activities as CRM, this label is a more accurate reflection of the aspirations of the industry than its present capability. Much of the industry has adopted what Batt and Moynihan (2002) call the classic mass production model of service delivery, which emphasizes transaction efficiency. Call centers adopting mass production models of work organization are referred to as transaction-oriented call centers (Kaplan, George, and Marines, 2000). This model seeks to minimize the cost per transaction by maximizing volume of calls and highly automating the flow of calls. Servicing the calls involves relatively simple tasks. Wages are relatively low and opportunities for advancement relatively limited. Discipline is enforced via extensive electronic monitoring. Work is stressful and turnover rates are high enough to encourage firms to locate their centers in regions where labor is relatively docile because of fewer employment opportunities.

Service delivery everywhere is faced with the tradeoff between quality of service and the cost of delivering it. Except for customer self-service, which is increasing, service delivery involves interaction between the customer and the service provider. Low service quality is immediately experienced by the customer and is therefore risky to the firm. Mass production or transaction oriented call centers attempt to reconcile the need for service quality with their search for efficiency by practicing "sacrificial HR strategy" –

the “deliberate, frequent replacement of employees in order to provide enthusiastic, motivated customer service at low cost” (Wallace, Eagleson, and Waldersee, 2000). For this reason, improvement in working conditions in mass production contact centers is not necessarily compatible with the business logic of the firm.

In professional service production models of contact centers (Batt and Moynihan, 2002), the situation is different because relationship management is a primary concern and so consistent service quality is essential. Contact centers that adopt the professional service production model attempt to build long term personal relationships with customers, and so provide superior service (Batt and Moynihan, 2002; Kaplan, George, and Marines, 2000). The more relationship-oriented the contact center, the more the center will adopt high involvement HR management practices characterized by service worker autonomy, task variety and interdependence, teamwork, and task integrity. The more transaction-oriented the contact center, the more it will adopt human resource management practices characterized by task routinization, scripting, cost minimization through volume of production, worker isolation, and electronic surveillance (Batt and Moynihan, 2002). Hybrid or mass customized models combine some aspects of transaction oriented contact centers with some aspects of relationship oriented contact centers (ibid.). Mass customized customer service attempts to compete on quality, customization, and price. Firms adopt engineered processes and automated workflows but allow agents to provide quality service to engender customer loyalty.

Services (which account for about three-quarters of gross domestic product in advanced economies) are associated with concepts of post-industrial or “knowledge-based” economies, and are at the center of the debate about the future of work. Will jobs in a service economy turn out to be good, bad, or ugly? (Tilly, 1996). The bifurcation of service jobs into good ones and bad ones (as measured on the seven job quality dimensions of wages, fringe benefits, due process, hours flexibility, permanence, mobility, and control over the work process [ibid.]) has been noted by many authors. Services range in knowledge intensity and economic value from very low to very high. Bifurcation of jobs is visible in customer service work and in contact centers as well: relationship oriented contact centers offer better jobs than transaction oriented contact centers. The kind of “production model” implemented by the firm depends on the strategy of the firm and the way that it chooses to compete, not on the technology that enables it. Research is needed to examine the consequences for job design and work organization of using increasingly complex information technologies in customer service work in transaction oriented and in relationship oriented contact centers. Moreover, further research is needed to model the relationships among job characteristics, work organization, job satisfaction, physical and psychosocial (stress) dimensions of health and wellness, human resource management practices, and performance outcomes in customer contact centers of each type.

Macroergonomics Issues in Customer Interaction Centers

It is hard to overstate the negative reputation that contact centers have acquired:

Currently, call centres appear to be the bete noire of organisational types. They have been labelled as 'electronic panopticons', 'dark satanic mills of the 21st century' and 'human battery farms'...(Holman 2002: 35)

Because of the prevalence of work-related health and safety issues in contact centers, they are classified by ergonomists as medium to high-risk workplaces (Read, 2001). No comprehensive data on workplace health and safety issues are available for contact centers, which are not identifiable through industry codes such as NAICS. The U.S. Occupational Health and Safety Administration (OSHA) estimated the direct and indirect costs of poor ergonomics to employers at US\$120 billion (Jacobs, 2000). Approximately one third of workers' compensation dollars go to repetitive motion injuries (ibid.). Although physical injuries are the most visible, contact center employees are known to be exposed to higher than average risk of mental health problems (Sprigg, Smith, and Jackson 2003).

No generally accepted ergonomics health and safety regulations exist. When they do exist, such regulations are usually found at the state or provincial level. However, competition among jurisdictions for contact center business has led some jurisdictions to relax their standards (Larner, 2002). In 1999 the U.S. Occupational Health and Safety Administration (OSHA) published an ergonomics standard, to come into effect in 2001, requiring that firms enact a seven-point ergonomics program covering management leadership and employee participation, job hazard analysis and control, training, MSD management, program evaluation, record keeping, and a grandfather clause. In March 2001, the Bush Administration and Congress scrapped OSHA's ergonomics standard.

This section briefly reviews the occupational risk factors in customer interaction centers, organized in terms of the Balance Theory's five elements of the work system: the individual, the environment, the task, the technology, and organizational factors.¹ Table 1 provides a summary of factors according to where each is found in the work system, its prevalence in transaction or relationship oriented customer contact centers, and its bio-physical or psychosocial nature.

In Balance Theory, the **Task element** has to do with the characteristics of the task that can affect performance, health and safety, such as job demands, workload, work pressure, job control, and cognitive demands. For example, Halford and Cohen (2003) report that workload was an important determinant of work related musculoskeletal disorders in call center workers. The **Technology element** has to do with the physical characteristics of the technology, such as design, user-friendliness, and ease of use. A substantial literature documents occupational health risks in use of office technologies (Amick 1999) and contact center technologies (see e.g. Queensland 2003). The **Environment element** has to do with issues such as noise, air quality, temperature, lighting, and work place layout. For example, a recent study by Niemela et al. (2002) finds differences in performance at a call centre due to temperature variation. The **Individual element** has to do with the personal considerations that determine the physiological

¹ Space does not permit discussion of hypothesized stress reduction factors or presentation of complete bibliography.

and psychological responses that the preceding factors will produce. Here we consider personality, skills and abilities, anthropometrics, physical and mental capabilities, and health status. Contact centers seek to recruit individuals who are customer service oriented, skillful communicators, problem solvers, conflict resolvers, strong listeners, conscientious, energetic, and resourceful (CCCCI, 2001). The **Organizational Factors element** has to do with the organizational context in which work tasks are carried out, such as work schedule, supervisor support, and career development. A large literature describes organizational factors in contact centers, and some of the literature links such factors with health outcomes (e.g. Holman 2002, Sznclwar et al. 1999).

Conclusion

Use of the Balance Theory within a macroergonomics framework can help to develop a systematic, empirical, and normative approach to job design and work organization in contact centers.² Although relaxed ergonomic standards permit abusive work conditions in contact centers, the contact industry itself has charted a course toward Customer Relationship Management, which implies increasing use of features of relationship oriented centers and decreasing use of features of transaction oriented centers. Occupational health and safety factors have a multitude of effects on performance in service operations. Of these factors, the physical effects of office technologies are the best documented. Some psychological and social features of job design and work organization in contact centers are increasingly recognized to entail occupational health risks. Furthermore, such features are also recognized to have significant effects on service performance. There are many indications in the research literature on contact centers that high involvement work practices can decrease occupational risks in customer contact work, while increasing performance and service quality. For example, performance monitoring can have positive or negative impacts on employee well being (Holman et al. 2002). Greater job satisfaction and higher performance in relationship oriented contact centers do not necessarily entail lower stress or lower call volume (Batt and Moynihan, 2002). Theoretical literatures on job design and work organization in customer-facing settings will also be useful (eg. Cardy, Gove and DiMatteo, 2000; Conti and Warner, 2002). Such findings point the way toward management practices for customer contact workplaces that are both effective and humane.

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² Space does not permit description of our data methodology (Ergonomic Work Analysis: Dos Santos and Fialho [1985]).

Table 1: summary of factors known to affect workplace wellbeing in customer interaction centers

Element of work system (Smith & Carayon, 1989)	Transaction oriented contact centers		Relationship oriented contact centers	
	physical	psychosocial	physical	psychosocial
Task	<ul style="list-style-type: none"> repetitive motion injuries and musculoskeletal disorders (wrist, arm, head, neck, upper back) voice strain 	<ul style="list-style-type: none"> exhaustion from "emotional labor" workload work pace electronic surveillance monotony social isolation role ambiguity scripting / low autonomy low task variety tech. systems failure 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers but presumably less intense 	<ul style="list-style-type: none"> performance (outcome) stress emotional labor role ambiguity quality of task variety and autonomy tech. systems failure
Technology	<ul style="list-style-type: none"> repetitive motion injuries and musculoskeletal disorders (wrist, arm, head, neck, upper back) monitor glare and eyestrain acoustic shock 	<ul style="list-style-type: none"> cognitive complexity limited customizability of workplace tools learning costs and risks 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers but presumably less intense 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers but presumably less intense
Environment	<ul style="list-style-type: none"> ambient noise air quality lighting office layout 	<ul style="list-style-type: none"> mood of internal surroundings (color, cleanliness) location of work 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers
Individual	<ul style="list-style-type: none"> anthropometric issues prior health status age gender 	<ul style="list-style-type: none"> attitudes personality intelligence literacy and numeracy economic needs and alternatives 	<ul style="list-style-type: none"> similar to those in transaction oriented contact centers 	<ul style="list-style-type: none"> factors are similar to those in transaction oriented contact centers although features of high and low performing individuals probably differ
Organization	<ul style="list-style-type: none"> work schedule 	<ul style="list-style-type: none"> employment security truncated career transient workers inadequate or inappropriate training bullying low job enrichment or job enlargement 'downstream' disruption of workflows inappropriate or dysfunctional group organization unbalanced incentive system conflict between efficiency and effectiveness goals 	<ul style="list-style-type: none"> work schedule 	<ul style="list-style-type: none"> career development quality of supervision quality of training quality of work organization quality of job enrichment / enlargement organizational failure to act on workflows unbalanced incentive system

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