

A systemic approach to aging in the work context

Ursula M. Staudinger · Catherine E. Bowen

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Abstract In this article we present the interdisciplinary, developmental and systemic approach to the study of work and aging that guides research at the Jacobs Center on Lifelong Learning and Institutional Development (JCLL). We introduce basic principles of adult development including its plasticity, multi-directionality, and embeddedness in contexts. We describe the different dynamic internal (e.g., psychological, physiological) and external contexts (e.g., organizations, labor market institutions) relevant to the work context that influence adult development. We present how the various disciplinary perspectives at the JCLL contribute to a fuller understanding of various contextual systems and their interactions with regard to the work context. Finally, we describe how a systemic approach to research on work and aging can contribute to the creation of work contexts conducive to productive development across the adult lifespan as summarized in the notion of dynamic human resource management. Importantly, we consider a wider notion of ‘productivity’ that encompasses not only economic aspects but also intellectual, motivational and emotional outputs.

Ein systemischer Ansatz zum Altern im Arbeitskontext

Zusammenfassung Der vorliegende Artikel stellt einen interdisziplinären, entwicklungsorientierten und systemischem Ansatz vor, der der Forschung zu Altern und Arbeiten bei der Jacobs Center on Lifelong Learning and Institutional Development (JCLL) zu Grunde liegt. Wir gehen hierbei auf die wichtigsten Grundsätze der Entwicklung Erwachse-

ner ein: Plastizität, Multidirektionalität (Entwicklung bringt Gewinne und Verluste mit sich) sowie Kontextabhängigkeit. Darüber hinaus beschreiben wir verschiedene dynamische interne (psychische, physiologische) und externe (z.B., Firmen, Strukturen des Arbeitsmarkts) Kontexte, die die Entwicklung Erwachsener beeinflussen und für den Arbeitskontext eine Bedeutung haben. Wir erklären wie die unterschiedlichen disziplinären Perspektiven am JCLL einen Beitrag dazu leisten, diese verschiedenen Kontexte der Entwicklung und deren Zusammenspiel zu verstehen und dadurch die Wechselwirkung zwischen Altern und dem Arbeitskontext zu erhellen. Schließlich legen wir dar wie ein systemischer Forschungsansatz zum Altern im Arbeitskontext einen Beitrag dazu leisten kann, Arbeitskontexte so zu gestalten, dass produktive Entwicklung über die gesamte Lebensspanne gefördert wird (im Sinne einer ‚dynamischen Personalentwicklung‘). Hierbei berücksichtigen wir eine weite Definition von ‚Produktivität‘, die nicht nur ökonomische Leistung sondern daneben auch intellektuelle, motivationale und emotionale Leistung umfasst.

Keywords Work · Aging · Contextualism · Systemic approach

Schlüsselwörter Arbeiten · Altern · Kontextualismus · Systemischer Forschungsansatz

1 Introduction

Ongoing demographic changes including longer lives, fewer births, and the rising median age of the workforce combined with the conditions and demands of the modern labor market pose major challenges to societies, organizations as well as (aging) individuals. Societies face the challenge

U.M. Staudinger (✉) · C.E. Bowen
Jacobs Center on Lifelong Learning and Institutional
Development, Jacobs University Bremen, Campus Ring 1,
28759 Bremen, Germany
e-mail: SEKstaudinger@jacobs-university.de

of increasing the proportion of older workers in the labor force in order to keep social welfare systems afloat. Companies face the challenge of staying innovative and productive with fewer young talents on the labor market. Individuals need to frequently update their skills and knowledge to maintain employability as well as be able to flexibly adapt to rapidly changing job demands. Above all, adults need to maintain their physical and psychological health as invaluable resources in their own right, as well as necessary resources for maintaining high levels of productivity throughout a career and across the lifespan.

At the Jacobs Center on Lifelong Learning and Institutional Development (JCLL), our research focuses on the analysis of productive adult development and aging. Importantly, ‘productive’ development is not only considered from the traditional economic perspective but also with consideration of individuals’ intellectual, emotional and motivational productivity through, for example, their civic engagement, provision of emotional support or by being a mentor (see below). Much of our research revolves around the (paid) work context as both a central influence on adult development and an important arena of adult productivity. With regard to the work context, we aim to understand how individual contexts (e.g., physical and psychological), organizational contexts and broader societal institutional contexts interact to produce outcomes on the individual as well as on the organizational and societal levels. In particular, we aim to understand and identify the contextual and individual conditions under which the upper limits of potential across the lifespan may be reached. We thereby hope to contribute to the ability of both individuals and organizations to better realize more of their potential.

Researching and understanding the complex interplay between work and aging necessitates an interdisciplinary and systemic approach. In this article, we present the fundamental guiding concepts of our approach, as well as present exemplary research findings from some of our research projects that help to illuminate the relationship between work, older age and adult development.

2 A more inclusive notion of productivity

In our study of productive adult development, we consider a wider notion of productivity that extends beyond the economic sphere and also includes intellectual, emotional and motivational productivity (e.g., Staudinger 2008). For example, people are also intellectually productive when they create and share ideas, solve problems, and give advice; emotionally productive when they contribute to their own and others’ emotional well-being, for example, through their vitality, their capacity for comforting others and their good humor, even in the face of difficulties; and motivationally

productive by inspiring others by, for instance, acting as a role model or helping *other* people to reach their goals. Also from an organizational perspective it is important to consider the multi-faceted ways in which employees can be productive. Indeed, the importance of ‘non-core’ dimensions of work performance such as sharing knowledge and experience with colleagues, maintaining a positive mood even when stressed as well as motivating others (i.e., *organizational citizenship behaviors*) has been acknowledged within the organizational literature. Such behaviors also benefit group and organizational effectiveness (Podsakoff et al. 2000). However, there is some evidence that employees and employers base estimates of work productivity of both older and younger workers to a greater extent on ‘hard qualities’ (e.g., willingness to learn new skills, flexibility) as opposed to qualities related to organizational citizenship behaviors (e.g., social skills, reliability) (Van Dalen et al. 2010). This suggests that people uniformly evaluate the productivity of older and younger workers, even though there may be systematic differences as to how younger and older adults contribute to workplace productivity. This underscores the necessity to consider multiple dimensions of employee productivity in any discussion of work and aging, particularly in light of meta-analytical findings which have revealed a normative age-related increase in organizational citizenship behaviors (Ng and Feldman 2008).

3 Development as a lifelong process

At the basis of our approach to the study of work, old age and aging is the notion that human development is a lifelong, multi-faceted and multi-dimensional process characterized by both gains and losses and intricately embedded in internal and external contexts (e.g., Baltes et al. 2006). In contrast to the view that development is uniformly characterized by gains up until a certain point (age) and then by uniform decline, empirical research supports the view that adult development is characterized by *both* gains and losses across the lifespan. For instance, decreases in the ‘cognitive mechanics,’ that is, the largely biologically based aspects of condition such as the speed of processing or the processing of novel information across the adult lifespan, are well known. At the same time, however, the cognitive pragmatics, or more knowledge-based cognition (e.g., knowledge gained from work experience), tends to increase through late middle-age (around age 55 or 60) and then remains stable until around 85 (see Baltes et al. 2006 for a review of age trends in cognition). Furthermore, a number of empirical studies support the contention that adults can compensate for decrements in cognitive mechanic resources by drawing on cognitive pragmatic resources (e.g., Lindenberger and Kray 2005). Gains as well as losses can also be

observed in the personality domain. Whereas emotional stability, agreeableness and conscientiousness typically tend to increase or at least remain stable across the adult lifespan, openness for new experience tends to stagnate sometime after adolescence and declines after midlife (e.g., Staudinger 2002).

Identifying normative developmental gains and losses as well as the conditions under which gains are realized and losses avoided or compensated for can help to identify the potentials as well as the limits of an aging and older workforce. Moreover, knowledge and understanding of development across the lifespan (in addition to the characteristics of the current cohort of older workers) can aid organizations to prepare for the challenges of an aging workforce by identifying specific areas where extra support may be needed not only to remediate declines but also to *prevent* potential declines. Furthermore, the developmental approach can help organizations create contexts in which they can profit from (potential) age-related gains as well as provide insight with regard to how organizations can provide that support. Still, while considering normative developmental trends, it is critical to keep in mind that older people (and older workers) are *not* a homogeneous group. In fact, with increasing age, chronological age becomes *less* informative about the skills and characteristics of a person (e.g., Staudinger and Kocka 2010). The increasing between-person variability and the possibility to compensate for normative age-related losses may lie behind the overall null-relationship between chronological age and core job performance (meta-analysis; Ng and Feldman 2008).

In addition to being characterized by both gains and losses, adult development is characterized by a considerable degree of *plasticity* (e.g., Baltes 1987; Lerner 1984). That is, development is neither completely fixed (predetermined), nor is it completely open. Plasticity refers to the range (and limits) of development and is an index of an individual's change *potential*, including how flexible and robust he or she might be in dealing with challenges and demands (resilience). Plasticity is not synonymous with development (i.e., change over time), but rather refers to the degree to which individuals (could potentially) diverge from usually observed developmental trajectories or their own usual level of performance. We are particularly interested in identifying the conditions—particularly in the work context—under which the upper potentials of plasticity are reached.

The degree of plasticity is contingent on the sum total of the “resources” available to the individual at any given time (e.g., Staudinger et al. 1995). Resources can come from internal contexts (e.g., psychological, physical) but also from the external contexts in which individuals are embedded (e.g., education, money, physical environment, social networks). For instance, psychological and physical health as well as motivational resources are important internal resources that in part determine an individual's potential to be

productive within the work context and in general. The work context, as one of the most important contexts of adult development, is in the position to provide many of the external resources that can facilitate—or hinder—productive development. Examples of resources in the work context include the demands of a job and the satisfaction derived from it; colleagues and, for example, the knowledge they have and share and the emotional and practical support they provide; human resource strategies that create access to further training resources; and at the societal level, laws and institutions that shape attitudes, expectations and opportunities with regard to career opportunities (e.g., job mobility) and retirement patterns. Indeed, many studies have demonstrated that a number of external resources in the work context influence productive adult development (for a review, see Bowen et al. 2010). For instance, intellectual engagement and cognitive stimulation, which can be provided by a challenging job, can promote more successful cognitive aging (e.g., Hertzog et al. 2009). As another example, the degree to which an employee is allowed to self-determine the content as well as the manner in which to fulfill responsibilities has important influences on more global control beliefs (Wickrama et al. 2008). Finally, analysis of the Whitehall II study participants ($N = 10,308$ at baseline) found that employees with chronic work stress (measured over 14 years) had more than double the odds of having metabolic syndrome (i.e., three or more risk factors for heart disease and type 2 diabetes, e.g., high blood pressure, high fasting glucose levels) than those without work stress, even after accounting for a range of other risk factors (Chandola et al. 2006).

4 Systemic study of developmental contexts

Importantly, human development is embedded and influenced by any number of internal and external contexts. Contexts of development should not be viewed as monolithic but rather as a complex system of interrelated circumstances (Bronfenbrenner 1979; Greve and Staudinger 2006). Internal contexts refer to individuals' biological/physiological resources as well as psychological resources. The biological and psychological subsystems are intricately intertwined with one another. The interplay between the biological and psychological subsystems is exemplified by, for instance, the robust longitudinal relationship between attitudes toward aging and various indicators of physical health and longevity. In one study, young and middle-aged adults (aged 18–49 years) with more negative old age stereotypes were significantly more likely to experience a cardiovascular event (e.g., angina attack, stroke) over the following 38 years than adults with less negative old age stereotypes even after adjusting for a number of relevant covariates (Levy et al. 2009). Individuals are also embedded within interrelated

systems of external contexts that likewise influence their productivity (in the more expansive sense) and development. With regard to the work context, learning experiences at the work place (and in other life domains), corporate human resource management, work organization, legal and educational frameworks, and societal perspectives on aging, work and lifelong learning all have the potential to either further or hinder productive adult development (see Fig. 1; cf. Staudinger 2006). Internal contexts and external contexts are inextricably intertwined with one another and can affect one another for better or worse, but can also compensate for one another. For instance, a given individual's learning style is crucial in predicting the success of a given learning context (Schulz and Stamov Roßnagel 2010). The dynamic interactions between different developmental influences at different contextual levels (e.g., individual, social, organizational, societal/institutional) necessitate an interdisciplinary research approach that pools knowledge and understanding of these different levels of contextual influences on development, as well as methodology, from different disciplines. To meet this necessity, the JCLL has successfully integrated expert knowledge from a diversity of different academic fields. Namely, experts from Neuroscience, Human Performance, Health Psychology, Lifespan Psychology, Organizational Behavior, Business Administration, and Life-course Sociology contribute to creating new insight into productive adult development. In general, our aim is to identify contextual and individual characteristics that are crucial to facilitate productive adult development and aging. This includes identifying changes in internal as well as external contexts and resources across the lifespan as well as understanding the processes mediating such changes. In line with our developmental, systemic approach, a range of disciplines are represented at the JCLL that each contributes to understanding how resources on various levels of internal and external contexts interact with each other.

4.1 Physical and psychological resources (internal resources)

Experts from Neurobiology and Human Performance at the JCLL investigate the neurological basis of human performance, namely, the mechanisms underlying cortical plasticity and the structure/function relationships between cognitive, sensory, and motor performance and learning. Research in this area aims to better understand how to facilitate cortical plasticity. These research questions are addressed using a combination of neuroimaging, neuropsychology, physiology, and movement science.

Several lifestyle factors such as a healthy diet and physical exercise can enhance health and facilitate recovery from health impairments, as well as compensate for age-related declines in cognition (e.g., Voelcker-Rehage et al. 2010).

For instance, in one longitudinal intervention study we have been investigating the effects of physical fitness on cognitive performance as well as emotion regulation. The major finding was that training increasing aerobic fitness (three times a week) effected significant increases in the speed of information processing which is one of the aspects of cognitive functioning that has the strongest age-related declines (Voelcker-Rehage et al. 2010). Experts in the field of Health Psychology aim to understand what internal and external factors motivate behaviors such as initiating and maintaining a healthy diet as well as physical exercise. It is crucial to not only focus on one kind of health behavior but take a number of health behaviors (i.e., healthy lifestyle) under consideration at the same time. In particular, understanding how external contextual factors can help support people in their efforts to maintain a healthy lifestyle is key to helping individuals reach the upper limits of their potential, as well as helping organizations to maintain a healthy workforce.

Finally, developmental experts from the field of Lifespan Psychology (cf. Baltes et al. 2006) provide knowledge on age-related changes in psychological functioning (e.g., cognition, emotion regulation, motivation, personality) across the lifespan as well as the interaction between work environments and psychological functioning and development. The specific focus lies in exploring which contextual influences may help to promote optimal aging. For example, in a quasi-experimental longitudinal study, it was demonstrated that participation in activating contexts (i.e., volunteering activity) promotes increases in openness to new experience, an important concomitant of personality growth and continued learning (Muehlig-Versen et al. 2011). This finding is particularly interesting in light of the normative age-related decreases in openness, as mentioned earlier. Specifically, older adult volunteers (>65 years) who (a) participated in an empowering training program and (b) had higher internal control beliefs increased in openness to experience. Volunteering alone did not stimulate increases in openness. These results suggest that a constellation of external (e.g., challenging contexts, empowering training) and internal (e.g., internal control beliefs) resources can indeed result in a reversal of typical age trends. As a further example, we are currently investigating relationships between 'images of aging' in the work context, that is, mental associations with age, older workers and aging, with work- and developmental-outcomes. Results of this ongoing area of research will be reported below. The Lifespan Psychology perspective contributes not only to our understanding of how features of the work context can contribute to productive development but also how development can contribute to the work context.

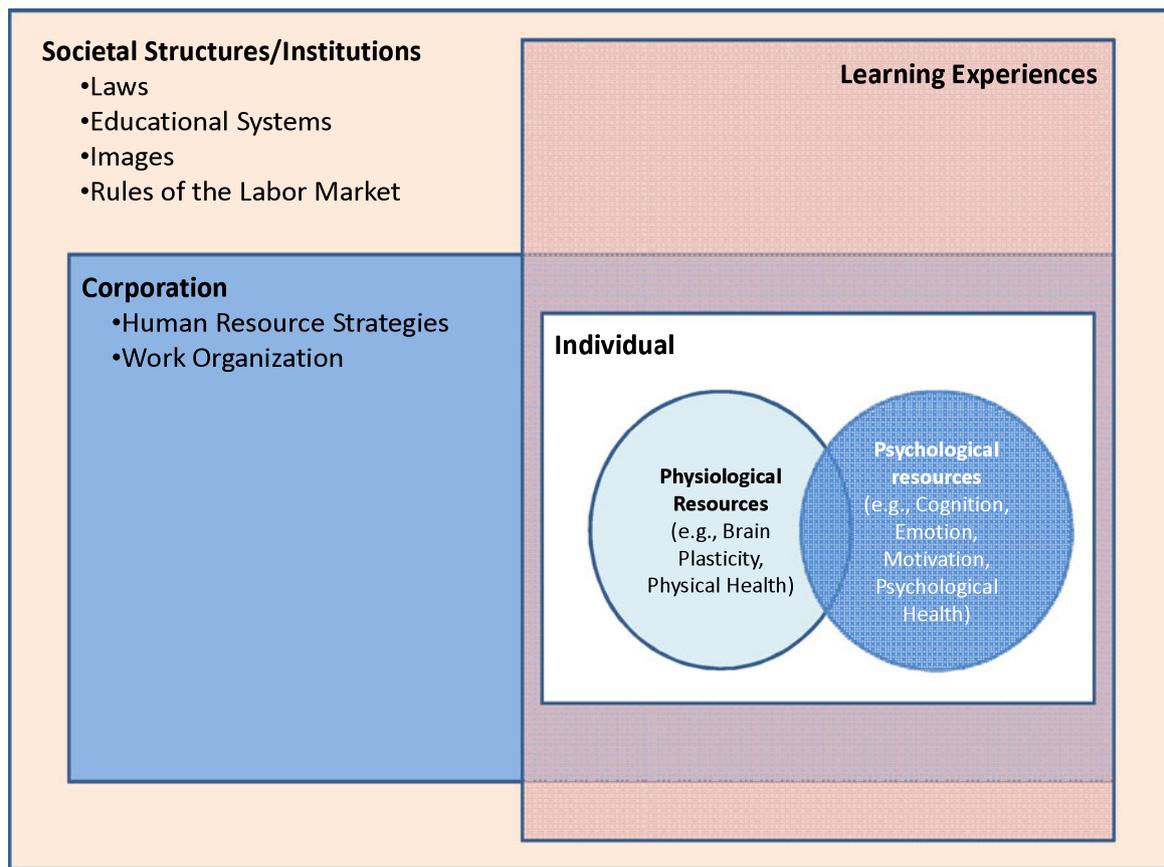


Fig. 1 Internal and external contextual influences on productive adult development as studied at the JCLL

4.2 External resources (or risk factors): organizational features

Experts from the fields of Organizational Behavior and Business Administration focus directly on how adults behave in organizational contexts. On the one hand, employees bring a set of (changing and not fixed) personal resources such as motivation, values, personality and competencies to the work context. On the other hand, work contexts offer a variety of external resources (or risks) such as task complexity, supervisor support and leadership styles, team diversity, organizational climate as well as human resource policies. It is a crucial finding that human development and aging are not predetermined but rather are the result of the continuous interaction between internal and external resources (or risk factors). Losses in some resources coupled with stability or growth in other resources lead to systematic patterns of qualitative changes in work behaviors. As one example, work at the JCLL has investigated age-related differences in work motivation. Motivation may decrease for some kinds of job tasks and increase for other kinds of job tasks, and likewise the level of effort employees commit to certain kinds of tasks (Stamov Roßnagel and Hertel 2010). Understanding how organizational behavior changes over the course of the

working lifespan, as well as the mediating mechanisms and moderating factors underlying such changes (e.g., changes in motivation), can aid in the creation of work contexts, for instance, through human resource practices, that facilitate lifelong productive behavior and development.

4.3 External resources (or risk factors): institutions

Experts from Life-course Sociology and Political Science investigate how labor market and political institutions influence employment careers (e.g., labor market entry, mobility, retirement), learning careers (e.g., formal qualifications, further training participation), as well as the link between employment and learning careers. Predominantly secondary data analysis of representative studies is used to compare employment and learning careers and their implications within different industrial sectors, regions within a country, as well as across countries. Such research helps to reveal how external contextual factors on the institutional level contribute to developmental pathways. For example, research conducted at the JCLL and based on data from the British Household Panel Study and the German Socioeconomic Panel suggests that divorce has different long-term effects on financial well-being in Britain and Germany.

Specifically, whereas men's economic resources in retirement remain unaffected by divorce in both countries, divorced women are more economically disadvantaged relative to their married peers in Germany than in Britain, even though pension-sharing regulations are more favorable for women in Germany. Thus, it seems that current income-related policies such as pension-sharing after divorce cannot counter the powerful impact that gendered employment institutions have on divorced women's long-term economic resources (Fasang et al. 2011).

To sum up, experts from a variety of fields offer expertise on human performance and functioning from a wide variety of perspectives. Research findings from laboratory experiments, questionnaire studies, secondary data analysis of representative samples as well as neurobiological methods (e.g., fMRI) and psycho-biological studies (e.g., endocrine studies) complement and reinforce each other. Much of our research is conducted within companies and in close collaboration with personnel decision-makers and thus creates an arena for the exchange of best practices and the cross-fertilization of academic and organizational knowledge and understanding. Field studies of employees' performance and attitudes can draw on insight into human performance and development gained in laboratory settings and at the same time the ecological validity of experimental results can be tested by applying them in the work context.

5 Interdisciplinary research projects on work and aging at the JCLL

Two interdisciplinary projects currently under way at the JCLL illustrate how experts from different disciplines can pool their knowledge to increase understanding of the relationships between features of the work context and individual performance: the Demopass Project and Project Mobilis.

5.1 The Demopass Project

Supported by the Bundes Ministerium für Bildung und Forschung, Project "Demopass" (derived from the German words "Demografie" and "Passung": demography and match/mismatch) examines matches and mismatches between several organizational levels (employees, management, and organizational climate) that are crucial for understanding organizational outcomes, such as employee health and productivity. Demopass identifies five fields of action that are specifically relevant to tackling the challenges posed by demographic change in organizations: (intergenerational) knowledge transfer, further training and on-the-job learning, images of aging in organizations, adaptive competencies at the work place, and physical as well as psychological health. All JCLL professors have worked together to contribute diverse perspectives within a joint research project.

The project aims to further our understanding of different facets of the work context and employee health and productivity, but also to inform management practice. It is the final goal of the project to develop a toolbox that companies can independently use to diagnose relevant strengths and weaknesses and thereby identify potential areas of intervention with regard to the aging workforce.

Data collection within the five cooperating companies has been completed. The project now has questionnaire data and indicators of objective health from roughly 1500 employees and their supervisors. A unique feature of the Demopass Project is its multi-level design, with individuals sampled within their work teams ($k = 112$). This design allows for the innovative analysis of not only individual factors but also *shared* contextual factors within the team using hierarchical regression models. For instance, the design allows for the appropriate analysis of the influence of the team supervisor's attitudes, perspectives and practices on employees. In addition, interviews with management representatives provided background information about corporate and work strategies.

Results from the Demopass Project have revealed important subtleties relevant for both research and organizational practice. For instance, results with regard to knowledge transfer within organizations showed that age was positively related to knowledge sharing and negatively to knowledge seeking, which is an important finding as it lays the ground for research on intergenerational knowledge transfer, and moreover stresses the importance of a distinction between the two knowledge transfer behaviors (Noethen and Völpele 2010). Furthermore, while intrinsic benefits (e.g., enjoyment) significantly influence both individual knowledge sharing and seeking, extrinsic benefits (e.g., money, prestige, more interesting task assignment) were found only to motivate knowledge seeking. This result may imply that different management strategies are needed in order to encourage knowledge seeking and knowledge sharing. Results from Demopass also showed that higher levels of chronic work stress in the form of an imbalance between perceived efforts and perceived rewards (effort-reward imbalance; Siegrist 2002) is related to higher levels of burnout but also lower job-performance as assessed by supervisors. These detrimental relationships are aggravated when employees are overcommitted to their work (i.e., have trouble 'switching off' from their work; Feuerhahn et al. 2010).

A number of results highlighted the importance of immediate supervisors. For example, the extent to which employees perceive supervisor support with regard to the pursuit of further training activities was related to learning self-efficacy, that is, the degree to which an individual feels that he or she has the appropriate learning competencies needed for successful further training (Baron and Schömann 2009). In turn, learning self-efficacy predicts actual participation in

further training activities (Maurer 2001). Importantly, the relationship between perceived supervisor support and learning self-efficacy was stronger for older (relative to younger) as well as less-educated employees. Therefore, supervisors seem to play a particularly important role in motivating older and less-educated employees to pursue further training activities. As a further example, how positively a supervisor felt about his or her own aging process did not have any direct relationship with employees' turnover intentions (Bowen and Staudinger 2011). Specifically, working with a supervisor who had more positive perceptions of his or her own aging was not necessarily associated with lower turnover intentions, that is, not all employees were necessarily 'attracted' (as reflected in lower intentions to leave their current job) by a supervisor with a positive outlook on his or her aging. Rather, the *similarity* between employee and supervisor aging self-perceptions was related to lower turnover intentions. Importantly, turnover intentions were particularly high among employees with rather positive aging self-perceptions with rather negative supervisors.

5.2 The Mobilis Project

Cognitive aging is not fixed but shows a tremendous amount of plasticity. This has been documented by decades of cognitive training research (e.g., Lindenberger and Kray 2005). Unfortunately, training research has also revealed that although training programs can lead to improvements in cognitive functioning, any gains tend to be specific to the practiced task(s) and only to a limited extent transfer to other tasks (Hertzog et al. 2009). Moreover, it seems neither reasonable nor practical for older adults to continuously undergo some type of cognitive training in order to remediate or prevent losses in cognitive functioning. Thus, the Mobilis Project aims to investigate the effect of a kind of natural cognitive training intervention, that is, the switching between job-related activities in the course of one's working life. Our major hypothesis is that for employees at lower and intermediate levels of qualification, a greater number of switches in the day-to-day activities may result in better cognitive and personality-related functioning at later ages (Zacher et al. 2011). In the sociological and the organizational behavior literature, job-related task switches are discussed under the heading of job mobility (i.e., switch between job-related activities). Job mobility also is causing heated political debate as it has become an increasingly important feature of the modern labor market and is suspected to be detrimental for the well-being of employees. It has typically been assumed that the increased demand for job mobility may have negative effects, and may pose in particular a challenge for older workers who are stereotypically thought to resist change (Posthuma and Campion 2009). However, it may also be the case that job mobility, as an intervention that forces people

to 'practice' flexibly adjusting to new work contexts and new demands, may under certain conditions help to compensate for some salient age-related declines in adaptive competencies. On the other hand, overly routinized (work) activities and the lack of substantial new challenges over several years may result in a decline of adaptive competences and levels of cognitive performance.

Funded by the Volkswagen Foundation, Project Mobilis investigates the cumulative effects of voluntary and involuntary job mobility on individuals' adaptive competencies in old age. Adaptive competence comprises both a cognitive and a personality component. With regard to cognition, our study focuses on perceptual and motor adaptation. With regard to higher cognitive functions, we examine whether a higher degree of job mobility supports better adaptation to new cognitive tasks as measured by learning curves. This includes the investigation of the neurobiological mechanisms underlying such adaptation processes. Adaptive competence in the domain of personality includes an individual's openness for new experiences, readiness to take risks, and flexibility. The Mobilis Project represents the collaboration experts from sociology, psychology and neuroscience. Methods and perspectives from each field contribute to a more complete understanding of the relationship between job mobility and adaptive competencies.

In an important first empirical step, we have used propensity score matching to construct samples from the longitudinal and representative German Socioeconomic Panel (SOEP). Propensity Score Matching allows filtering persons with nearly identical characteristics differing only in respect to the specific factors of interest, thus resulting in a quasi-experimental study design. The samples differ with respect to their job mobility (high or low mobility) but have been carefully matched for variables that have been empirically demonstrated to be related to adaptive competencies (e.g., job profiles, social participation, health, and educational qualifications). In order to account for gender-specific career paths, samples of men and women will be analyzed separately, resulting in a design with four different groups of participants (i.e., male-mobile, male-immobile, female-mobile, female-immobile). Furthermore, we need to consider that more adaptive adults also experience or seek out more job mobility. For instance, an adaptive personality, characterized by openness, may lead to a stronger motivation for changes and mobility. Thus, we need to control for openness to experience at the entry to the labor market.

Given equal openness at baseline, we expect that those individuals with more switches in job-related activities will display higher levels of adaptive competence at later ages (Zacher et al. 2011). Indeed, first results indicate that people with more varied work biographies (i.e., more job mobility) invested more time in education at higher ages and also showed higher levels of openness to experience relative

to carefully matched controls. The observation period covered 18 years (Schömann et al. 2011). In future work, we will continue to use these samples to investigate the relationship between job mobility and other indicators of productive adult development, including job-specific aspects like job commitment and job satisfaction. Furthermore, we will recruit new samples to test the relationship between job mobility and cognitive functions using neurophysiological and neuropsychological methods (functional MRI, behavioral tests) to examine cognitive adaptivity and learning abilities.

6 Creating ‘development friendly’ work contexts

One of the major aims of the research at the JCLL is to use our research to inform organizational strategies. When considering the aging workforce it is important to keep in mind the seemingly obvious fact that how we are at older ages is at least in part the result of all that has happened before. This seemingly obvious fact is, however, ignored when companies focus interventions only on older workers, although this may well be the age group that needs the most support and attention. Work environments of the early periods of a work biography are at least if not more important for work-related productivity 20 years later. In sum, organizations need to focus on creating ‘development friendly’ work contexts that support productive performance and development across the adult lifespan.

Creating such development-friendly work environments necessitates taking an integrated, developmental approach to human resource management that encompasses interventions and active management across various domains particularly relevant for productive performance and development. We have summarized this approach in the concept *Dynamic Human Resource Management* (D-HRM; Staudinger 2007; Staudinger et al. 2008). The central assumption of D-HRM is that workers and jobs alike significantly and systematically change across work life. This alters the ‘fit’ between workers and their jobs, which has been shown to be an important determinant of job satisfaction and commitment, as well as work motivation (e.g., Stamov Roßnagel and Biemann 2011). Ensuring fit becomes even more important with age as motivation becomes an increasingly important determinant of performance, as the aging individual is forced to more carefully allocate his or her resources (e.g., Hess et al. 2009). In fact, recent work suggests that age-related changes in motivational variables, as opposed to chronological age per se, underlie changes in work outcomes for middle-aged and older workers (Kanfer and Ackerman 2004).

One of the objectives of D-HRM is to provide tools for proactive fit management in order to enable facilitative working conditions in five fields of action across work life:

competence management, diversity management, knowledge and experience transfer, health management and climate management. Competence management involves continual assessment of the fit between individual competencies and job demands as well as investment in skill development through formal but also informal further training measures (e.g., courses, job rotation, horizontal career moves). Importantly, formal and informal measures of further training need to be tailored to an individual’s (age-related) needs, desires and abilities. Diversity management that concentrates not only on sex and ethnicity but also on age can contribute to optimal productivity. For instance, experimental research has demonstrated that under certain circumstances (e.g., in a positive, respectful climate), collaboration between young and old interaction partners can lead to benefits for both in terms of better cognitive performance for the older interaction partner and less egocentrism among the younger interaction partners (Kessler and Staudinger 2007). Knowledge and experience transfer, in particular between generations, can help more experienced employees to update their knowledge as well as prevent less experienced employees from having to ‘re-invent the wheel.’ It is particularly important to avoid potential knowledge loss when colleagues enter retirement. A number of formal and informal strategies can be used to encourage knowledge transfer (e.g., job rotation, mentoring programs, alumni networks of retired employees). Modern health management needs to not only focus on ensuring a safe working environment and proper ergonomic design but also on informing individuals about the consequences of a healthy lifestyle as well as providing ample opportunity to practice such a lifestyle in the work context, for instance, by providing healthy food choices in the cafeteria and making physical exercise an integral part of work life.

Finally, organizations need to pay attention to the organizational ‘climate’ with regard to learning, the image of aging, communication and health. For example, companies appear to vary with regard to their ‘age climate,’ that is, shared perceptions concerning how positively older workers within the organization are regarded (Noack and Staudinger 2011). Moreover, a case study analysis has suggested that organizational age climate is associated with organizational age management strategies such as knowledge management, health and retirement practices as well as further training policies and practices. In turn, how an individual employee perceives the image of older workers within the company has been related to their affective commitment to the organization (Noack et al. 2011a), as well as older workers’ (>40 years) self-reported work ability (Noack et al. 2011b). Namely, employees who reported more positive perceptions of the image of older workers were more committed to their organization and reported higher work ability. Furthermore, results have demonstrated that employees of all ages who

perceive a more positive image of older workers within the company have lower turnover intentions (Bowen and Staudinger 2011). As this research example demonstrates, the climate/social atmosphere in organizations is another contextual feature of the work context that can either act as a resource or a risk with regard to both individual and organizational productivity.

7 Conclusions and outlook

In order for research to reveal meaningful insight about the relationship between work and aging, it is necessary to recognize the various contexts in which the developing individual is embedded. The complex, dynamic and interrelated contexts at various levels of abstraction that influence development necessitate a systemic, interdisciplinary, and a process-oriented approach. It is critical to the study of work and aging to recognize that aging is an ongoing, lifelong process that does not suddenly begin at any particular age. Such an approach can help identify the contextual conditions that can facilitate—or hinder—the exploitation of the potential for productive development across the lifespan and contribute to an understanding of how individuals and corporations interact to form developmental outcomes within the work context (e.g., participation, performance) as well as more generally. Exploiting the full potential of an aging workforce necessitates not only interventions that target older workers, but also setting up younger workers for productive trajectories and continual efforts to optimize development within the workforce across the working life. In a society of longer lives, it is important to create work environments such that longer working lives become possible, productive, and also desired.

Executive summary

In this article we present the interdisciplinary, developmental and systemic approach to the study of work and aging that guides research at the Jacobs Center on Lifelong Learning and Institutional Development (JCLL). Our aim is to understand the individual and contextual conditions under which the maximum potential of productive adult development is realized. Much of our research focuses on the work context, both as an influence on adult development and an important outlet of productive behavior. Importantly, we consider a wider notion of ‘productivity’ that encompasses not only economic aspects but also intellectual, motivational and emotional outputs.

We take a developmental approach to work and aging. We introduce basic principles of adult development including its plasticity, multi-directionality, and embeddedness in

contexts. Adult development consists of gains *and* losses, and is characterized by plasticity. Plasticity refers to the range (and limits) of development and is an index of an individual’s change potential. In other words, development is characterized by a large, but not infinite, range of possibilities. There is an increasing amount of inter- as well as intra-individual variability in the gains and losses associated with aging, and furthermore, individuals can compensate for losses. Development takes place in a complex system of interrelated circumstances, including dynamic internal (e.g., psychological, physiological) and external contexts (e.g., organizations, labor market institutions). This is important because the degree of plasticity is contingent on the sum total of the “resources” available to the individual at any given time. Resources can come from internal contexts but also from the external contexts—such as the work context—in which individuals are embedded.

Following from these basic principles of development, we argue that the study of work and aging necessitates an interdisciplinary approach. We describe the research conducted at the JCLL, which includes experts from a number of disciplines ranging from neuroscience and human performance, health and lifespan psychology, organizational behavior and life-course sociology and political science. We cite examples of research within disciplines that help to illuminate the potential as well as limitations of adult development on each level of analysis, as well as the conditions under which maximum potential for productive performance and development are reached.

We describe two examples of interdisciplinary research conducted at the JCLL, the Demopass Project and Project Mobilis. Demopass identifies five fields of action that are specifically relevant to tackling the challenges posed by demographic change in organizations: (intergenerational) knowledge transfer, further training and on-the-job learning, images of aging in organizations, adaptive competencies at the work place, and physical as well as psychological health. A unique feature of the Demopass Project is its multi-level design, with individuals sampled within their work teams. As examples of some of the findings of this study, age is associated with enhanced knowledge transfer and lower knowledge seeking behavior which may be improved by extrinsic benefits. Secondly, a subjective imbalance between effort and reward is associated with a higher risk of burn-out and lower productivity as rated by supervisors. Thirdly, it has been shown that team supervisor support appears to be especially important for motivating older and less-educated employees to participate in further training. Project Mobilis assesses the impact of job mobility, as a ‘naturally occurring’ cognitive training intervention, on the cognitive and personality functioning of older adults. Our major hypothesis is that for employees at lower and intermediate levels of qualification, a greater number of switches

in the day-to-day activities may result in better cognitive and personality-related functioning at later ages. Initial results indicate that people with more varied work biographies (i.e., more job mobility) invested more time in education at higher ages and also showed higher levels of openness to experience relative to carefully matched controls.

Finally, we describe how a systemic approach to research on work and aging can contribute to the creation of work contexts conducive to productive development across the adult lifespan as summarized in the notion of Dynamic Human Resource Management (D-HRM). The D-HRM notion emphasizes that development is a lifelong process; thus, organizations should not only focus on interventions for older workers but also on preparing younger and middle-aged employees for productive trajectories. The main assumption underlying D-HRM is that there is a dynamically changing fit between workers and their jobs across the lifespan, which in turn determines job satisfaction, commitment and motivation, and ultimately performance. We argue that organizations can benefit from proactively managing the changing fit between employees and their work across five domains, including: competence management, diversity management, knowledge and experience transfer, health management and climate management.

Kurzfassung

Der vorliegende Artikel stellt einen interdisziplinären, entwicklungsorientierten und systemischen Ansatz vor, der der Forschung am Jacobs Center on Lifelong Learning and Institutional Development (JCLL) zum Thema Altern und Arbeit zu Grunde liegt. Wir streben danach zu verstehen wie unter Berücksichtigung interner und externer Umstände das maximale Potenzial für eine produktive Entwicklung erreicht werden kann. Ein großer Anteil unserer Forschung konzentriert sich auf den Arbeitskontext, sowohl als ein zentraler Einflussfaktor auf Entwicklung, aber auch als eine wichtige Sphäre für produktives Verhalten. Wir berücksichtigen eine weite Definition von ‚Produktivität‘, die nicht nur ökonomische Leistung, sondern auch intellektuelle, motivationale und emotionale Leistung umfasst.

Wir verfolgen einen entwicklungs-basierten Ansatz zu Arbeit und Altern. Wir beziehen uns auf die wichtigsten Grundsätze der Entwicklung Erwachsener: Plastizität, Multidirektionalität (Entwicklung bringt Gewinne und Verluste mit sich) sowie Kontextabhängigkeit. Entwicklung besteht immer aus Gewinn und Verlust und wird durch Plastizität charakterisiert. Plastizität verweist auf die Spanne (sowie Grenzen) der Entwicklung und ist ein Index des Potenzials der Veränderung eines Individuums. Anders gesagt, Entwicklung wird am besten durch eine große aber nicht unendlich weite Spanne der Möglichkeiten umschrieben. Die

Variabilität der altersabhängigen Gewinne und Verluste, sowohl zwischen Menschen als auch innerhalb eines Menschen, wird mit zunehmendem Alter größer. Außerdem ist es möglich, Verluste zu kompensieren. Darüber hinaus findet die Entwicklung in einem komplexen System, bestehend aus dynamisch-internen (psychische, physiologische) und externen (z.B., Organisationen, Strukturen des Arbeitsmarkts) Kontexten, die die Entwicklung Erwachsener beeinflussen und für den Arbeitskontext eine Bedeutung haben, statt. Dies ist wichtig, weil das Ausmaß der Plastizität davon abhängt, wie viele ‚Ressourcen‘ zu einem bestimmten Zeitpunkt zur Verfügung stehen. Ressourcen können sowohl aus internen Kontexten, aber auch aus externe Kontexten (wie z.B. aus dem Arbeitskontext) in die man eingebettet ist, gewonnen werden.

Im Einklang mit diesen Grundsätzen der Entwicklung argumentieren wir, dass die Forschung von Arbeit und Altern einen interdisziplinären Ansatz verlangt. Ein breites Spektrum an Perspektiven aus unterschiedlichen Disziplinen ist am JCLL vorhanden. Sowohl Experten der Neurowissenschaften, Human Performance, Gesundheitspsychologie und Psychologie der Lebensspanne, als auch Experten aus dem Bereich organisatorisches Verhalten, der Soziologie der Lebensspanne und Politikwissenschaft, arbeiten zusammen, um die Wechselwirkung zwischen Altern und dem Arbeitskontext zu entschlüsseln. Wir zitieren Beispiele unsere Forschung, die 1) einen Beitrag dazu leisten, die Potenziale sowie Grenzen der Entwicklung auf verschiedenen Ebenen zu verdeutlichen, und 2) unter welchen Umständen das maximale Potenzial des produktiven Verhaltens und der Entwicklung erreicht werden könnte.

Im Folgenden beschreiben wir zwei Beispiele der interdisziplinären Forschung am JCLL, nämlich das Demopass Projekt und Projekt Mobilis. Das Projekt Demopass betrachtet fünf betriebliche Handlungsfelder, die angesichts des demografischen Wandels von zentraler Bedeutung sind: psychische sowie physische Gesundheit, Lernen und Weiterbildung, (inter-generationaler) Wissenstransfer, die Anpassungsfähigkeit, sowie Altersbilder im Arbeitskontext. Das besondere an diesem Projekt ist das Multi-Ebenen Design, in dem Mitarbeiter innerhalb eines ganzen Team befragt wurden. Um nur ein paar Beispiele der Ergebnisse zu nennen wurde etwa gezeigt, dass Alter mit mehr Wissenstransfer und weniger Wissenssuche in Zusammenhang steht. Desweiteren wurde das aktive Suchen nach Wissen von Kollegen eher mit extrinsischen Belohnungen assoziiert. Ein subjektiver Mangel an Gleichgewicht zwischen Anstrengung und Belohnung wurde mit einem erhöhten Risiko für Burnout und Arbeitsproduktivität, die durch den direkten Vorgesetzten beurteilt wurde, assoziiert. Ein letztes Beispiel der Ergebnisse hat angedeutet, dass Unterstützung durch den Vorgesetzten ein wichtiger Faktor für die Weiterbildungsteilnahme älterer Mitarbeiter und Mitarbeiter mit niedrigem Bildungsabschluss ist.

Das Projekt Mobilis untersucht den Einfluss der Arbeitsmobilität als ein ‚natürliches‘ kognitives Training auf kognitive und Persönlichkeitsfunktionen älterer Erwachsener. Unsere Hypothese ist, dass für Mitarbeiter mit niedrigem oder mittlerem Bildungsabschluss, eine große Anzahl von Veränderungen von täglichen Aktivitäten im Zusammenhang mit besseren kognitiven und Persönlichkeitsfunktionen im höheren Alter stehen. Erste Ergebnisse deuten an, dass Menschen mit abwechslungsreichen Arbeitsbiographien (i.e., mehr Arbeitsmobilität) im höheren Alter mehr Zeit in Weiterbildung investiert haben und ein höheres Niveau an Offenheit für neue Erfahrungen gezeigt haben, als Menschen in einer vergleichbaren Kontrollgruppe mit weniger abwechslungsreichen Arbeitsbiographien.

Schließlich beschreiben wir, wie ein systemischer Forschungsansatz zum Altern im Arbeitskontext einen Beitrag dazu leisten kann, Arbeitskontexte so zu gestalten, dass eine produktive Entwicklung über die gesamte Lebensspanne gefördert werden kann (im Sinne einer ‚dynamischen Personalentwicklung‘). Das Konzept einer dynamischen Personalentwicklung unterstreicht, dass Entwicklung ein Prozess ist, der sich über die gesamte Lebensspanne erstreckt. Deshalb sollten Organisationen Interventionen nicht nur auf ältere Mitarbeiter fokussieren, sondern auch versuchen, jüngere Mitarbeiter und Mitarbeiter der mittleren Alters auf eine produktive Entwicklung über die gesamte Lebensspanne vorzubereiten. Der Hauptgrundsatz einer dynamischen Personalentwicklung ist, dass die ‚Passung‘ zwischen Mitarbeiter und ihrer Arbeit sich mit der Zeit verändert, was wiederum Einfluss auf Arbeitszufriedenheit, Betriebszugehörigkeit und Arbeitsmotivation, und letztendlich Arbeitsproduktivität hat. Wir argumentieren, dass Organisationen davon profitieren können, wenn sie die Initiative ergreifen, um die Passung in den folgenden fünf Bereichen aktiv zu ermöglichen und zu verbessern: Kompetenzmanagement, Diversitätsmanagement, Wissens- und Erfahrungstransfer, Gesundheitsmanagement und Arbeitsklimamanagement.

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Ursula M. Staudinger is Professor of Psychology, Academic Dean and Vice President of the Jacobs University Bremen. She has published widely on adult development in the work context, resilience and plasticity across the lifespan, personality development and wisdom. She is Vice President of the National Academy of Sciences Leopoldina, a Fellow of the American Psychological Association as well as the Association of Psychological Science, and a member of the Heidelberg Academy of Sciences. Between 2008 and 2010 she was president of the German Psychological Society. She is a member of the Demography Advisory Group of the German government.

Catherine E. Bowen is a postdoctoral fellow at the JCLL. Her work follows a broad, interdisciplinary perspective and revolves around the relationships between social contexts and adult development, with a special interest in the work context as well as images of aging. Following university studies in the US and the Netherlands in Mathematics, Economics, Sociology and Education, she recently completed a Ph.D. in Psychology at the JCLL. She has work and volunteer experience with people aged 5 to 100 and she is passionate about understanding the conditions under which people of all ages are able to maximize their potential.