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Inhalt

Arbeit zwischen Fremd- und Eigenkontrolle – Möglichkeiten und Grenzen humaner Arbeitsgestaltung in der DDR[1]

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ZUSAMMENFASSUNG

Trotz politisch-ökonomischer Restriktionen konnten in der ehemaligen DDR auf der Grundlage der Handlungsregulationstheorie erfolgreiche Pilotprojekte einer humanen Arbeitsgestaltung realisiert werden. Beispiele aus dem Maschinenbau, der Textil- und Informationstechnologie werden aufgezeigt. Für die zukünftige Gewährleistung einer humanen Arbeitsgestaltung werden Gefahren benannt, die aus einem neo-liberalen Menschenbild erwachsen. Die Fixierung von Humankriterien in Normen und Gesetzen ist dringend erforderlich.

Schlüsselworte

Arbeitsgestaltung – Handlungsregulationstheorie – neo-liberales Menschenbild – Arbeitsschutz in der DDR

ABSTRACT

Despite political-economic restrictions, pilot projects on human-oriented work design on the basis of action regulation theory were successfully implemented in the former GDR.

Examples in the fields of engineering, textile and information technology are provided. Furthermore, the article demonstrates risks arising from a (neo)liberal human image that endanger future development and sustainable protection of human-oriented work design.

The protection and preservation of human-oriented work design by incorporating the human-oriented criteria into European law and standards are urgently required.

Keywords

Work design – action regulation theory – (neo)liberal human image – occupational safety in the former GDR

Grenzen der Umsetzung

In den Jahren nach der politischen Revolution 1989 mussten wir wenigen Arbeitspsychologen an den Hochschulen der DDR uns von westdeutschen Kollegen mitunter bittere Vorwürfe anhören. Wieso hätten wir nicht stärker auf Missstände in der Wirtschaft der DDR hingewiesen und in unseren Artikeln und Tagungen oft so positive Beispiele der Gestaltung gesunder und persönlichkeitsförderlicher Arbeit vorgestellt, die doch im offensichtlichen Widerspruch zur desolaten Lage des Landes stehen würden?

Dabei gab es diese Gestaltungsbeispiele der pilothaften Umsetzung der in unseren Lehrtexten entwickelten psychologischen Theorien der lern- und persönlichkeitsförderlichen vollständigen Tätigkeit, der produktiven und gesunden Nestmontage und des teilautonomen Arbeitens an modernen CNC-Maschinen wirklich. Aber es waren eben nur Gestaltungsinseln lokaler Umsetzung der Theorien unter wissenschaftlicher Begleitung, die keine Nachhaltigkeit fanden.

Ich erinnere mich noch der gemeinsamen Freude des Lektors des Deutschen Verlages der Wissenschaften in Berlin und der Autoren Winfried Hacker und mir

[1] Erstveröffentlichung im Ausstellungskatalog „Arbeit! Ostdeutsche Arbeitswelt im Wandel 1945-2015“ (hg. von DIK u. VBG, 2015).

über die Bearbeitung von einem Lehrtext zur Arbeits- und Ingenieurspsychologie für den renommierten westdeutschen Springer-Verlag. In vier Stunden mussten lediglich im Vorwort zwei obligatorische römische Ziffern (Parteitage!) gestrichen und Marx-Zitate etwas ausgedünnt werden, um 1984 als häufig zitiertes Lehrbuch in Westdeutschland gedruckt zu werden. Offensichtlich existierten abgeschirmte akademische Freiräume, in den der moderne Wissenschaftsstand rezipiert und kreative Theorien entwickelt werden konnten. Das war möglich durch die Nutzung schmaler Austauschfenster, die z. B. den Dresdner Kollegen offen standen nach der TU Berlin (West), der TU Wien und – seit Mitte der 70er Jahre sogar vertraglich geregelt – mit der ETH Zürich. Rückblickend kann man sagen, dass diese Kontakte eine wechselseitige Anregung ermöglichten, die uns eine relativ unbehinderte wissenschaftliche Arbeit im neuen Deutschland eröffnete.

Wie konnte in den frühen Phasen der DDR eine anwendungsbereite Forschung zur humanen Arbeitsgestaltung entstehen, die in Westdeutschland stark rezipiert worden ist?

Integration der Arbeitspsychologie in den Arbeits- und Gesundheitsschutz der DDR

Bereits mit dem SMAD-Befehl Nr. 150 wurde 1945 eine Organisation zentraler Steuerung des künftigen Arbeitsschutzes geschaffen. Das wurde mit der Unfallverhütungsvorschrift Nr. 1 1947 in der sowjetischen Besatzungszone vertieft, die jedoch auch die vorliegenden berufsgenossenschaftlichen Erkenntnisse aufgriff. Schon frühzeitig wurde ein System überbetrieblicher Überwachungsorgane eingeführt, bestehend aus Arbeitsschutzinspektionen (Gewerkschaft), Technischer Überwachung (Staatliche Plankommission) und Arbeitshygieneinspektionen (Ministerium für Gesundheitswesen), (Wienhold, 2011). Jeder Arbeitshygieneinspektion war auf Kreisebene eine Arbeitshygienische Untersuchungsstelle (AHUS) zugeordnet, in denen Fachärzte für Arbeitshygiene, Arbeitspsychologen und Techniker kooperativ zusammenarbeiteten. Diese AHUS hatten eine relativ unabhängige Stellung, da sie über den Kreisbetriebsarzt dem staatlichem Gesundheitswesen zugeordnet waren. Damit waren sie in ihrer Arbeitsweise unabhängiger als die westdeutschen Betriebsärzte, die dem Unternehmen direkt zugeordnet sind.

Schon im Jahre 1951 kam es zu einer Kooperation zwischen der TH Dresden und Dresdner Großbetrieben (VEB Sachsenwerk Dresden, VEB Stanzilla Dresden) mit dem Ziel, gemeinsam von Wissenschaft und Praxis getragen, einen modernen Arbeitsschutz umzusetzen, der das Primat der Technik und die Schaffung gefahrenloser Technik vor persönliche Schutzmaßnahmen setzte. Diese „Wegetheorie“ der Arbeitssicherheit war maßgebend für die Entwicklung eines modernen Arbeitsschutzes. Nach der Wiedervereinigung wurde diese Leitprinzip mit seinem Entwickler Prof. Erwin Gniza am Dresden Zentralinstitut für Arbeitsschutz (ZIAS) auch bestimmend für die gesamtdeutsche Strategie des Arbeitsschutzes.

Foto 1: An der Linotype. ND-Druckerei Berlin, um 1960 (Evelyn Richter – Archiv der Ostdeutschen Sparkassenstiftung im Museum der bildenden Künste Leipzig).[2]

Diese frühen Kooperationsverträge beruhten auf der langjährigen Zusammenarbeit von Ingenieuren und Psychologen an der TH Dresden (Walter Blumenfeld, Werner Straub, Jiri Dolezal schon in den 30er Jahren) und waren entscheidend für eine praxisorientierte Ausbildung von Diplom-Psychologen, die nach 1947 wieder einsetzte. Damit eröffnete sich auch das Erprobungsfeld der in den 60er Jahren sich entwickelnden neuen Theorie. Der Handlungspsychologie – ein kreativer Entwurf des jungen Winfried Hacker – gelang es, die bis in die 60er Jahre herrschende tayloristische Kontrolltheorie (Taylor, 1913) durch eine Integration der sowjetischen Psychologie (Sergej Rubinstein, Nikolaj Leontjev, Boris Lomow) mit einem ganzheitlichen Ansatz aus den USA von Miller, Galanter & Pribram (1960) zu verbinden. Damit konnte der vorherrschende Reiz-Reaktions-Ansatz und damit das ökonomische Menschenbild theoretisch überwunden werden und der Ansatz des planenden, zielgerichteten Handelns der Persönlichkeit zu einer eigenständigen neuen Theorie entwickelt werden.

Das fand bei jungen westdeutschen Psychologen (Walter Volpert, Eberhard Ulich, Siegfried Greif) großes Interesse, aus dem eine enge wechselseitige Theorieweiterentwicklung folgte.

[2] Alle 5 Fotos sind im Katalog „Evelyn Richter. Rückblick-Konzepte-Fragmente“, Museum der bildenden Künste Leipzig, Kerber Verlag 2005, enthalten.

Diese Theorieentwicklung passte ausgezeichnet in den damaligen weltweiten Siegeszug der Kybernetik. Das Prinzip des Regelkreises, schon 1932 durch den deutschen Techniker Walter Oppelt entworfen, besonders von Norbert Wiener in den USA weiterentwickelt, wurde durch den russischen Neurophysiologen Pjotr Anochin besonders für die Psychologie fruchtbar gemacht.

Foto 2: ND-Druckerei Berlin, um 1960 (Evelyn Richter – Archiv der Ostdeutschen Sparkassenstiftung im Museum der bildenden Künste Leipzig).

Schon hieraus wird deutlich, wie eng die wechselseitigen Beziehungen waren, die die politischen Grenzen der Machtblöcke durchdringen konnten. In der Frühphase der DDR bestand eine große Aufgeschlossenheit für die Anwendung der Prinzipien der Kybernetik und Heuristik. Die daraus erwachsende Wissenschaftskonzeption „Kybernetik“ an der Akademie der Wissenschaften und die daraufhin entstandenen Arbeiten fanden u. a. einen beachteten Niederschlag in den Mac-Inter-Symposien unter Leitung von Friedhart Klix an der Humboldt Universität bis 1989, deren Textbände alle bei Elsivier – North-Holland publiziert wurden.

Diese Forschung stand immer im Spannungsfeld zu den tayloristischen Prinzipien hocharbeitsteiliger Arbeitsgestaltung, die nach 1910 vor allem in der Automobilproduktion weltweit bestimmend war.

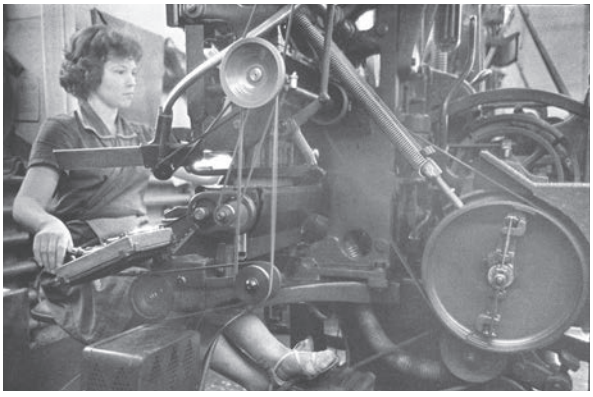

Foto 3: An der Linotype, ND-Druckerei Berlin, um 1960 (Evelyn Richter – Archiv der Ostdeutschen Sparkassenstiftung im Museum der bildenden Künste Leipzig).

Technische Neuerungen beginnen mit der Vereinfachung menschlicher Arbeit und deren externen Kontrolle

Das Fließband, zuerst in den 80er Jahren des 19. Jahrhunderts in den Chicagoer Schlachthöfen eingesetzt, um die in die Städte drängenden Menschenmassen ernähren zu können, revoltierte am Beginn des 20. Jahrhunderts die Massenproduktion, verbunden wurde dies mit der „Wissenschaft Betriebsführung“ (Taylor, 1913), deren Kernelemente die Trennung von Kopf – und Handarbeit, eine extreme Segmentierung manueller Verrichtungen, den durch die Produktionsvorbereitung vorgegeben „one best way“ bei relativ guter Bezahlung waren. Ziel war von vornherein neben einer hohen technologischen Disziplin eine extreme Kontrolle der Arbeiter durch die jeweils Herrschenden (Köhler, 2007).

Wladimir Iljitsch Lenin war stets ein Bewunderer von Kontrollsystemen. In „Staat und Revolution“ war es die Kontroll-Mechanik der Deutschen Reichspost, nach dem 1. Weltkrieg das Kontrollsystem des Taylorismus. Noch die Wissenschaftliche Arbeitsorganisation (WAO) der DDR war von diesem Traum technologischer Kontrolle menschlicher Arbeit und Systemen vorbestimmter Zeiten geprägt; Entwicklungen, die die kapitalistische Welt perfektioniert hatten, vor allem in der Massenproduktion von Autos und elektronischen Güter.

Doch schon frühzeitig regten sich Widerstände, so zum Beispiel durch die deutschen Gewerkschaften, die sich auf ein humanistisches Menschenbild beriefen und Konzepte teil-autonomer Gruppen und ganzheitlicher, vollständiger Tätigkeiten entwarfen (Hacker, 1973; Volpert, 1975; Ulich, 2011).

Er wäre einer Vertiefung Wert zu zeigen, wie diese Entwicklungen die Veränderungen in der Militärorganisation von der Lineartaktik der stehenden Heere über die Tirailleur-Taktik der napoleonischen

Revolutionstruppen hin zum Delegationsprinzip der „Auftragsordnung“ auf Untergebene des Generalstabes der deutschen Wehrmacht nachvollzog (van Creveld, 1998).

Diese technologischen Entwicklungen wurden in beiden Deutschlands begleitet von Diskussionen der Entfremdungstheorie von Karl Marx (Volpert, 1975). Entfremdung war parteioffiziell im Sozialismus jedoch bereits überwunden. Der Wirtschaftswissenschaftler Harry Nick und der Philosoph John Erpenbeck reflektierten diesen Prozess und erfuhren von der marxistischen Orthodoxie ausreichend Fundamentalkritik. So wurden z. B. auch eigene methodische Bemühungen heftig kritisiert, Monotonie-Erleben messbar zu machen, da Monotonie dem Sozialismus „wesensfremd“ und angstbezogene Stress-Zustände völlig untypisch seien. Dennoch setzte sich die Messung derartiger negativer Beanspruchungsfolgen durch und wurden in der DDR publiziert (Plath & Richter, 1984). Sie erscheinen soeben 30 Jahre später auf Grund der großen Nachfrage in neuer überarbeiteter Auflage (Debitz, Plath & Richter, 2015).

Drei Gestaltungsbeispiele aus der Arbeitswelt der DDR mögen diesen weit verbreiteten Ansatz einer Humanisierung der Arbeit (so der Titel eines Forschungsprogramms in der BRD ab 1974) verdeutlichen. Der Hannoveraner Arbeitswissenschaftler Schweres machte auf die offensichtliche Parallelität der Entwicklungen in beiden deutschen Staaten aufmerksam (Schweres, 2008).

Die Einführung peripherer Programmierung von NC-Werkzeugmaschinen vor Ort (CNC-Technik), die in den 80er Jahren einsetzte, ermöglichte den schon immer hochqualifizierten Werkern, eine erweiterte Autonomie von den Produktionsvorbereitungs-Abteilungen und damit von der Vormachtstellung der programmierenden Ingenieure.

Von der Sektion Arbeitswissenschaften an der TU Dresden wurde ein interessantes Experiment begleitet. Aus einem ehemaligen halbstaatlichen Betrieb in Sachsen wurden zu einem Programmierkurs für CNC-Werkzeugmaschinen keine Ingenieure, sondern erfahrene Dreher und Fräser gesendet. Nach anfänglicher Ablehnung durch die Ausbilder entstand eine quasi-experimentelle Situation, die aufzeigte, dass bei entsprechender Qualifikation und dem Einräumen von Handlungsspielräumen, diese komplizierten Maschinen auch ohne akademisches Studium bestens beherrscht werden können.

Bis zum Ende der DDR wurde insbesondere im Zentralinstitut für Arbeit (ZFA) Dresden durch umfangreiche Begleitforschung, die von der Projektierung bis zur Realisierung komplexer Produktionssysteme reichte, Folgendes nachgewiesen: Bei Gewährleistung vollständiger Tätigkeiten (neben dem manuellen Ausführen sind auch vorbereitende, kontrollierende, überwachende und organisierende Teiltätigkeiten zu realisieren) und der Sicherung aufgabengerechter Qualifikation sind die komplexen Anlagen von Facharbeitern mit hoher Effizienz und Zuverlässigkeit zu beherrschen; und das bei hoher Arbeitszufriedenheit und ohne negative Beanspruchungsfolgen wie Ermüdung, Monotonie oder Stress (Plath, Pflicht & Torke, 1987, 1990).

Diese Begleitforschung lief parallel zu den Gestaltungsarbeiten von Ingenieuren an der TH Zwickau, die die Überlegenheit ganzheitlicher Nestfertigung bei der Montage von Kleinmotoren nachweisen konnten (Enderlein, Tannhauer & Wolf, 1983), wenn entsprechende psychologische Gestaltungkriterien Berücksichtigung fanden (Neubert & Tomczyk, 1986). Selbst in der traditionell auf das Fließband orientierten Konfektionsindustrie konnte nach sorgfältigem Training die Überlegenheit von Gruppenarbeit gegenüber Fließbandarbeit nachgewiesen werden (Rieger, 1987; Bergmann, 1999).

Nach der politischen Revolution 1989 konnte z. B. bei der Einrichtung eines neuen Call Centers in Forst gezeigt werden (im Rahmen des durch die Verwaltungs-Berufsgenossenschaft koordinierten Projektes „CCall“), dass eine Arbeitsbereicherung der monotonen Front-Office Arbeit mit reiner Telefonie durch Back-Office Aufgaben (z. B. der Auftrags-Aquise und Abrechnung) Leistungsbereitschaft und Arbeitszufriedenheit merklich erhöhen konnten (Richter, Debitz & Pohlandt, 2009). Das gelang durch eine Aufgabenbereicherung der Call Center Agents, die in einem partizipativen Prozess von ihnen selbst erarbeitet wurde. Die kritische Telefonie-Zeit konnte von 75 % auf 60 % vermindert werden, ohne dass es zu einem Produktivitätsrückgang kam! Ein Befund, der die Pathologie der Auslagerung der Kommunikationsprozesse in speziell dafür auf engstem Raum eingerichteten tayloristischen Organisationen deutlich werden lässt.

Am offensichtlichsten ist wohl gegenwärtig der immer noch anhaltende Kampf gegen neo-liberale Konzepte im Pflegebereich zu beobachten, der sich gegen eine vordergründig ökonomische Sicht auf die stark durch Emotionsarbeit gekennzeichnete Pflege richtet. Die Befunde zeigen überzeugend, dass eine Ganzheits-Pflege gegenüber einer elementaren Funktions-Pflege motivationssteigernd und Burnout-reduzierend wirkt (zusammenfassend Hacker, 2009). Am Beispiel der stationären Altenpflege konnte gezeigt werden, dass diese schwere Tätigkeit, die aus einer unauflösbaren Kombination von körperlicher Arbeit und Emotionsarbeit besteht, mit höherer Effektivität und geringeren Burnout-Symptomen bewältigt werden kann, wenn durch veränderte Arbeitsorganisation den Pflegkräften Tätigkeitsspielräume und größere Eigenverantwortung eingeräumt wird, die sozialen Beziehungen der Teams verbessert werden und die

Führung als fair erlebt werden kann (Buruck & Richter, 2014; Brom et al., 2015).

Diese Beispiele sollten verdeutlichen:

1. Die weltweite Auseinandersetzung mit der tayloristischen Arbeitsgestaltung und der Versuch einer Aufhebung der Entfremdung in der Arbeit durch die Einführung ganzheitlicher, vollständiger Aufgabenstrukturen, sozialer Kooperationsbeziehungen und fairer Führung haben sich auch in der DDR abgespielt.
2. Diese Auseinandersetzung scheint sich mit jeder neuen technischen Innovation zu wiederholen.
3. Ein Kern dieser Auseinandersetzung ist sicherlich in den Kontrollambitionen der Kapitaleigner gegenüber den als widerständig erlebten Arbeitnehmern zu suchen und in der entsprechenden neo-liberalen Ausrichtung der Ausbildung von Ingenieuren und Betriebswirten und entsprechender restriktiven Arbeitsorganisation.

Humanisierung der Arbeit vs. Vermarktlichung aller Lebensbereiche

Die HdA-Projekte in der BRD wie der DDR orientierten auf eine Umsetzung der Gestaltungsutopie der Gesundheits- und Persönlichkeitsförderlichkeit von Arbeit. Bereits die Human Relations-Bewegung entwickelte Gestaltungsprinzipien der Aufgabenrotation, -erweiterung und -bereicherung, sowie ganzheitliche Gruppenarbeit.

Derartige Gestaltungsmerkmale wurden in den letzten Jahren in ingenieurmäßig umsetzbare DIN-Normen, die inzwischen zu internationalen Standards wurden, fixiert (DIN EN ISO 10075, DIN EN ISO 6385).

Dabei handelt es sich im Kern um
- vollständige Arbeitseinheiten,
- Vielfalt von Aufgaben,
- Handlungsspielräume,
- ausreichend und sinnvolle Rückmeldungen,
- Qualifikationsnutzung und deren Weiterentwicklung in der Arbeit und
- Vermeidung sozial isolierender Arbeit (Hacker & Sachse, 2014, S. 24).

Dahinter steht ein langwieriger, konfliktreicher arbeitspolitischer Prozess. Die ersten Normierungsversuche psychischer Belastungen reichen bis in die 60er Jahre des vergangenen Jahrhunderts zurück. Neuerdings erst fand der in der DDR-Arbeitswissenschaft entwickelte Stressbegriff (Plath & Richter, 1984) Eingang in die Überarbeitung der Belastungs-Norm (DIN SPEC 33418, 2014).

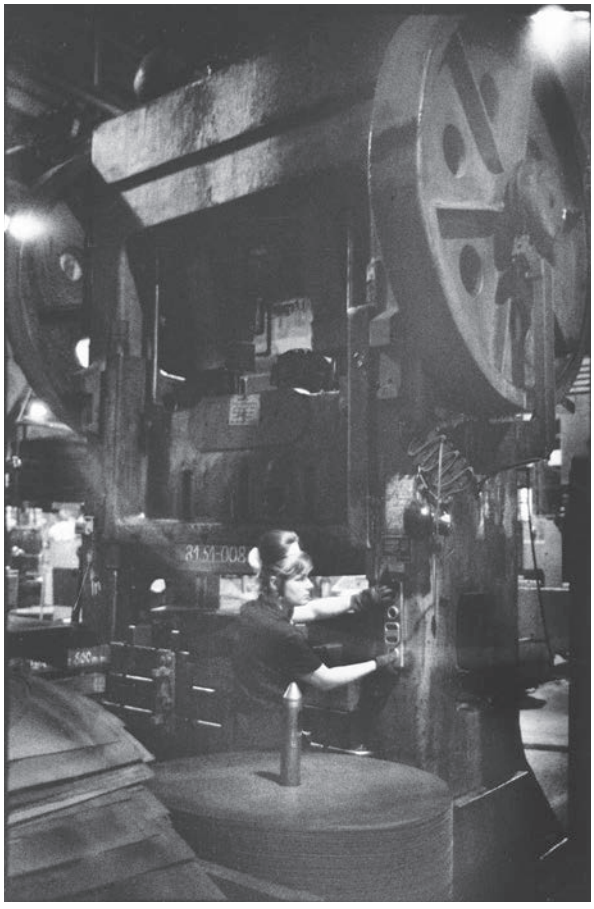

Foto 4: An der Stanze, Dessau, 1966 (Evelyn Richter – Archiv der Ostdeutschen Sparkassenstiftung im Museum der bildenden Künste Leipzig).

Foto 5: Kammgarnspinnerei, Leipzig, 1970 (Evelyn Richter – Archiv der Ostdeutschen Sparkassenstiftung im Museum der bildenden Künste Leipzig).

Diese Entwicklungslinie wird seit ca. 20 Jahren weltweit konfrontiert mit einer Vermarktlichung und Monetarisierung aller Lebensbereiche, die sich besonders verheerend in den Fürsorgeberufen (Pflege, Bildung, Umwelt) auswirkt.

Neue, aus den USA und Japan importierte Managementkonzepte der ausschließlichen Ausrichtung auf „Rentabilität“ und „Kundenorientierung“ bestim-

men das wertschöpfende Handeln: Lean Production, Business Process Engineering, Total Quality Management, New Public Management, Managed Care.

Davon sind nicht nur Produktionsbereiche, sondern zunehmend auch Verwaltungs- und Humandienstleistungen betroffen. Die Tendenz zur weiteren Individualisierung der Arbeit, Selbstverantwortung, räumlichen und zeitlichen Entgrenzung und biografischen Diskontinuität, die den modernen „Arbeitskraftunternehmer“ (Voß & Pongratz, 1998) kennzeichnen, rufen die Gefahr einer „Balkanisierung der Arbeitsverhältnisse“ (Castel, 2000) herauf. Besonders betroffen von dieser Entwicklung ist der immer bedeutsamere Bereich der Emotionsarbeit, die den emotionalen Kitt der modernen Gesellschaft sichert. Am deutlichsten spiegelt sich das in der Ökonomisierung des Gesundheitswesens wider. Die totale Vermarktung von Fürsorgearbeit erhöht Burnout-Risiken der betroffenen Mediziner und Pflegekräfte. Der katholische Ethiker Friedhelm Hengsbach hat das treffend formuliert: „So muss in Zukunft nicht jede gesellschaftlich nützliche Arbeit vermarktet und erwerbswirtschaftlich organisiert werden. Ein ununterbrochener Tanz der Arbeitsgesellschaft um die Erwerbsarbeit würde sogar in eine Sackgasse münden. Die Menschen sind nicht das, was sie produzieren, und leben nicht, um zu arbeiten (Hengsbach, 2001, S. 116).

Auf diese herannahende Marketing-Orientierung hat bereits frühzeitig Erich Fromm aufmerksam gemacht und von einem eigenständigen Marketing-Charakter der modernen Gesellschaft gesprochen. Dabei handelt es sich um eine Verhaltensbereitschaft, die deutliche Entfremdungsformen aufweist: Extreme Anpassungsbereitschaft, Bindungslosigkeit, Coolness und Egoismus als Handlungsgrundlage (Weber, 2006). Dieses propagierte Eigennutzprinzip kommt einer Gesellschaftspathologie gleich. Den Kern dieser Marketing-Orientierung hatte Erich Fromm bereits 1947 gekennzeichnet.

Wenn etwas wahr ist an der aufgestellten These, dass jede neue technische Entwicklung mit einer Tendenz der Vereinfachung menschlicher Arbeit und einer verstärkten organisatorischen Kontrolle einhergeht, so werden sich diese zwei Strebungen (Humanisierung der Arbeit vs. Vermarktung und Autonomiekontrolle) – die hier für die DDR-Wirtschaft exemplarisch aufgezeigt worden sind – in einem steten sozialpolitischen Kampf befinden.

Wenn es den jeweils Herrschenden gelänge, sich von dem alten traditionellen Menschenbild des homo oeconomicus zu lösen und in der humanistischen Denkkultur von Karl Marx, Albert Schweitzer und Erich Fromm in Rechnung zu stellen, dass die Möglichkeiten zur Entfaltung der Persönlichkeit und Selbstverwirklichung in der Arbeit enorme Produktivitätsressourcen frei zu setzen vermag, könnte der immerwährenden Tendenz zur Rückkehr zu fremdgesteuerten tayloristischen Organisationsformen menschlicher Arbeit entgegen gewirkt werden.

Der Nutzen einer solchen neuen Arbeitsgestaltung kann schließlich auch ökonomisch nachgewiesen werden, also in der Sprache des Controlling, die letztlich die ökonomische Welt beherrscht.

Den größten Anteil an den Frühverrentungskosten resultiert heute in Deutschland aus dem erlebten Verlust an Handlungsspielräumen und Gratifikationskrisen (Bödeker & Friedrichs, 2011). Die Gesundheitsförderlichkeit durch Sinnhaftigkeit und Durchschaubarkeit von Aufgaben, Vollständigkeit und Vielfalt von Arbeitsanforderungen, Tätigkeitsspielräumen sowie Lern- und Entwicklungsmöglichkeiten in der Arbeit kann als gesichert gelten. Bereits 1973 hat Hacker in der 1. Auflage seines Lehrbuches der Arbeitspsychologie diese Zusammenhänge herausgearbeitet. Humphrey, Nahrgang & Morgeson (2007) konnten in einer Meta-Analyse der vorliegenden Literatur zeigen, dass es sich bei diesen Tätigkeitsstrukturen um die entscheidenden Motivationsfaktoren handelt, die 25 % der subjektiven Arbeitsleistung und 43 % des Arbeitsengagements voraussagen lassen. Methoden sind entwickelt worden, die eine quantitative Abschätzung des „return-on-investment“, also in der Sprache der Ökonomie, von Maßnahmen humaner Arbeitsgestaltung erlauben (Fritz & Richter, 2011).

Diese Befunde gilt es zu verbreiten, um auch das ökonomische Nutzens-Potenzial modernen Arbeits- und Gesundheitsschutzes deutlich werden zu lassen.

Die in der DDR parallel zum HdA-Programm der BRD entwickelte Strategie der Gesundheits- und Persönlichkeitsförderlichkeit von Arbeit spiegelte das Bemühen wider, vergleichbare Pfade zu beschreiten, die allerdings weitgehend eine Utopie unter widrigen Umständen bleiben musste.

Für unbelehrbare Unternehmen sollte gelten, dass – vergleichbar der Einführung der Ökosteuer – auch für die „Vernutzung“ lebendiger Arbeit ökonomische Konsequenzen für die Prozess- und Produktkosten eingeführt werden. Dabei gilt aber, wie in jeder guten Pädagogik, das Bonus-System für herausragende Leistungen Malus-Systemen vorzuziehen sind. Das könnten z. B. sein Best-Practice-Awards, oder Beitragsentlastungen an Unfall- und Krankenkassen. In Diskussion der EU sind ab 2017 Veröffentlichungen der Nachhaltigkeits- und Sozialverträglichkeits-Situation der Unternehmen.

Der Kampf um die Humanisierung der Arbeitswelt ist seit jeher darauf gerichtet, das Ausmaß entfremdeter Arbeit zu verringern. Entfremdung in den Marx’schen Facetten macht Rosa (2013) in der Gegenwart am totalitären Charakter einer sich immer mehr beschleunigenden Welt fest. Verlust von Authentizität und Autonomie der handelnden Subjekte kennzeich-

nen die moderne Welt. Die angeführten Pathologien der Arbeitswelt sind heutige Ausdrucksformen entfremdeter Arbeit. Humanisierung der Arbeit ist in den modernen, mobilen und virtuellen Weltbeziehungen mehr denn je Herausforderung an ein arbeitswissenschaftliches Handeln. „Der Erschöpfungszustand der Arbeitenden dieser Gesellschaft hat einen Grad erreicht, der die Identität der Subjekte antastet und die Gesellschaft mit einer depressiven Gefühlslage überzieht“ (Negt, 2011). Der Kampf gegen emotionale Erschöpfung und Werteverunsicherung ist eine der großen Herausforderungen der Gegenwart.

In allen Gesellschaften gab es immer die autonome Haltung gesunder unabhängiger Menschen sich dem aufgezwungenen Druck und Selbstwertverletzung zu entziehen. Die DDR war voll von entsprechenden Biografien. Eine der jüngsten beeindruckenden Schilderungen ist im Roman „Kruso“ von Lutz Seiler zu finden.

Lyrisch hatte diese Haltung bereits Friedrich Rückert (1837) in dem kurzen Gedicht „Ungebundenheit“ beschrieben:

> *„Es ist, bei Gott, nicht wohlgetan / Im Schwanken dieser Zeiten / Um etwas, das dich fesseln kann / Als um ein Gut zu streiten.*
> *Sei frei, in jedem Augenblick / Dein Bündelein zu schnüren / Und dreh nicht selbst dir den Strick / daran man dich kann führen.“*

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Individual work design as a job demand: The double-edged sword of autonomy[1]

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ABSTRACT

This qualitative study developed and examined the role of high autonomy in relation to individual work design as a job demand. We argue that designing one's own job may require additional effort beyond dealing with the job demands associated with the core work tasks. We conducted 41 semi-structured interviews with employees with high levels of autonomy and flexibility at work, revealing different work characteristics that need to be designed, along with individual efforts to cope with the work situation. Some of these efforts were clearly necessary to work efficiently, ensure long-term professional success and preserve internal resources. They represented an increase in expended effort in addition to working on regular tasks, supporting our concept of individual work design as a job demand. This study contributes to the research on job autonomy, challenging its positive reputation as one of the most important job resources.

Keywords

Individual work design – autonomy – job demands

The shift from manufacturing to a more service-oriented economy during recent decades has been accompanied by the growing use of innovative technologies and flexible work methods (Demerouti & Bakker, 2014; Morgeson & Humphrey, 2008), as well as competitive pressure and a higher speed at which work is completed (Grant & Parker, 2009; Ilgen & Hollenbeck, 1991). New managerial practices that have accompanied this development include, for example, project work and management by objectives to promote employees' self-organization and self-control (Höge, 2011). Static jobs progressively make way for more flexible and dynamic tasks, roles and projects to be able to react to the market and customer demands in a more flexible manner (Ilgen & Hollenbeck, 1991). Employees are increasingly given more autonomy in executing their own work (Wood, 2011; Eichmann, 2006; Pongratz & Voß, 2003), accompanied by high responsibility (Hacker, 2003). This trend is especially observed in jobs that require a highly qualified staff (Garhammer, 2002; Pongratz & Voß, 2003).

When autonomy is high, as in self-employment and very flexible autonomous jobs, there is no set framework in which work is executed, and there are no guidelines as to how to accomplish one's work tasks; therefore, *individual work design* becomes indispensable. Individuals must make decisions regarding their tasks and task characteristics, their working hours, their work place and their social relationships at work (Allvin, Aronsson, Hagström, Johansson & Lundberg, 2011). Kubicek, Paškvan and Korunka (2014) argue that an increase in job autonomy has not only given employees the possibility to make decisions independently, but they are also forced to make these decisions. These decision-making demands (Kubicek et al., 2014) may then entail additional effort beyond actually completing one's work tasks. For example, planning as an action process takes additional effort,

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especially combined with the few resources that are available (Frese & Zapf, 1994). We argue that jobs very high in autonomy can lead to a requirement to individually design one's own work, which is accompanied by increased effort beyond the execution of regular work tasks.

Job design theories, such as the job characteristics model (e.g., Hackman & Oldham, 1976), the job demand-control model (e.g., Karasek & Theorell, 1990), action theory (e.g., Frese & Zapf, 1994) or the job demands-resources model (JD-R model; Bakker & Demerouti, 2007), propose that autonomy constitutes one of the most important job resources. Hackman and Oldham (1976) define autonomy as „the degree to which the job provides substantial freedom, independence and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out" (p. 258). It affects the degree to which individuals experience responsibility for their work outcomes. Autonomy has been shown to have positive effects on various behavioral, well-being and attitudinal outcomes, such as performance, job satisfaction, organizational commitment, internal work motivation, lower emotional distress, burnout, absenteeism and turnover (de Jonge & Schaufeli, 1998; de Lange, Taris, Kompier, Houtman & Bongers, 2004; Humphrey, Nahrgang & Morgeson, 2007; Spector, 1986; Thompson & Prottas, 2005). The positive effects of autonomy are a product of employees' abilities to choose to engage in tasks that are interesting and personally meaningful (Gagné & Bhave, 2011) and to choose their own strategies to address a situation (Frese & Zapf, 1994).

However, Warr (1987) argued in his Vitamin Model that autonomy is related to mental health in an inverted u-shaped pattern: High levels of autonomy can entail high degrees of uncertainty, responsibility and difficult decision making, leading to overload strain. Likewise, Busck, Knudsen and Lind (2010) raise the question of whether job autonomy constitutes a psychological strain. They argue that an increase in job autonomy, for example through empowerment and self-management, might go hand in hand with higher responsibility and a demand of higher performance. In a similar manner, Claessens, van Eerde, Rutte and Roe (2004) claim that in dealing with job demands, self-management has become a critical issue.

Pongratz and Voß (2003) describe jobs very high in autonomy in their concept of the 'entreployee'. In these types of jobs, autonomy is accompanied by an increase in self-control, self-commercialization and self-rationalization. Pongratz and Voß (2003) define self-control as the „planning, control and monitoring of work by the person responsible" (p. 8). Self-commercialization means advertising and selling one's capacities and abilities on the labor market as well as within organizations. Employees become more and more responsible for the development and maintenance of their work capacities to demonstrate their value for their current employer as well as for the labor market (Höge, 2011; Wiese, 2008). Self-rationalization refers to the management and organization of individual resources, and in the case of the entreployee, to „the tendency to accept willingly the importance of the company (employer) as an integral part of life" (Pongratz & Voß, 2003, p. 8). Based on these considerations, Höge (2011) developed the concept of flexibility requirements at work. These flexibility requirements may challenge employees to constantly balance and rationalize the resources they allocate to their work and their private lives (Höge, 2011). Höge (2011) identified four dimensions of flexibility requirements: (a) requirements for self-organization, (b) requirements for a self-directed career development, (c) requirements for self-directed learning and (d) requirements for temporal flexibility. All of these dimensions, except for requirements for temporal flexibility, relate positively to job control (Höge, 2011), which can be understood as autonomy in the way the work is executed (see Semmer, Zapf & Dunckel, 1999). These results show that flexibility requirements seem to be accompanied by high autonomy, leading to the possible conclusion that the need to be flexible at work can only be realized when autonomy is high, allowing employees to exert control over the way work is executed. All dimensions of flexibility requirements show significant correlations to strain indicators, showing that flexibility requirements can be considered a demand (Höge, 2011).

In sum, Pongratz and Voß (2003) as well as Höge (2011) described a new form of work, characterized by an increase in autonomy, which encompasses an increase in self-control, self-commercialization and self-rationalization, accompanied by the requirement to be flexible. As a result, the necessity to design one's own job may increase, as in defining task goals or engaging in project management. When autonomy leads to a lack of predictability and a binding framework in which work is being executed (Korunka & Kubicek, 2013), employees may be forced to regulate and design their own job to be able to work efficiently, to reach goals and to ensure sustainable productivity and health.

To examine these new demands that employees face more closely, Kubicek et al. (2014) developed the concept of work intensification, referring to the increase in effort an employee has to invest in order to complete his or her work tasks during the day. Kubicek et al. (2014) postulate an increase in intensified job-related planning and decision-making demands, intensified career-related planning and decision-making demands, intensified knowledge-related learning demands and intensified skill-related learning demands, all of which showed positive relationships with emotional exhaustion after controlling for traditional

job demands, such as time pressure. The authors concluded that „an ever-growing amount of planning and decision-making and learning has detrimental effects on employees' well-being" (Kubicek et al., 2014, p. 14). Looking at the possible impact of work intensification on work design by providing in-depth qualitative data analysis, we argue that jobs very high in autonomy can lead to the requirement to individually design one's work.

Work design theories explain how aspects of jobs, tasks and roles affect individual, group and organizational outcomes (Grant & Parker, 2009). Understanding how individuals experience their job has long been their primary goal (Wrzesniewski & Dutton, 2001). Work design can affect several outcomes, such as organizational performance, well-being, satisfaction and absenteeism (see Morgeson & Humphrey, 2008).

Work design theories traditionally focus on top-down processes, examining the way organizations create jobs for their employees, as well as the conditions under which work is being performed (Hackman & Oldham, 1976; Demerouti & Bakker, 2014). The research on job redesign adds to the research in the field by focusing on the processes that take place when organizations or supervisors change something about the job, the task, the role or the working conditions of an individual or a group (Tims & Bakker, 2010).

New approaches in work design focus on the active role the individual plays in the process of work redesign (Demerouti & Bakker, 2014). Proactive approaches, such as job crafting, hypothesize that employees create a motivating potential themselves by shaping and changing their job characteristics individually (Wrzesniewski & Dutton, 2001). Wrzesniewski and Dutton (2001) define Job Crafting as „the physical and cognitive changes individuals make in the task or relational boundaries of their work" (p. 179).

Physical changes refer to the form or number of activities performed while on the job, and cognitive changes represent an alteration of how one sees the job. The process of changing relational boundaries is characterized as deciding with whom and how one interacts on the job (Wrzesniewski & Dutton, 2001). According to Wrzesniewski and Dutton (2001), job crafting is a creative process through which individuals change their jobs to create a suitable definition of the work they do and who they are at work. Tims and Bakker (2010) expanded the research on job crafting, basing their concept on the JD-R model. They define job crafting as „the changes that employees may make to balance their job demands and job resources with their personal abilities and needs" (Tims, Bakker & Derks, 2012, p.174). As a form of proactive behavior, it may support employees in fitting their jobs better to their individual abilities, skills and knowledge, as well as to their preferences and needs (Tims & Bakker, 2010). According to Petrou, Demerouti, Peeters, Schaufeli and Hetland (2012), another aim of job crafting is to create working conditions that support sustainable health and motivation to work.

In sum, the way in which employees engage in designing their own work has already been well described in the concept of job crafting. However, in contrast to job crafting, which is conceptualized as proactive and voluntary, we assume that individual work design is reactive and necessary – reactive because we consider it a reaction to a certain job environment, in which high autonomy leads to a lack of guidelines as to how, when and where to accomplish work tasks, resulting in the need to individually design one's own work – and necessary because without individual work design, employees would not be able to work efficiently, reach work goals and ensure long-term employability by making room for recovery.

In this study, we sought to investigate whether employees high in autonomy perceive designing their own job as necessary and whether individual work design is accompanied by increased effort. In this sense, it is hypothesized that individual work design constitutes a job demand. Within the JD-R model, job demands are defined as „physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (cognitive and emotional) effort or skills and are therefore associated with certain physiological and/or psychological costs" (Bakker & Demerouti, 2007, p. 312). Examples include cognitive demands, task complexity, time pressure, work overload and work-home conflict (Schaufeli & Taris, 2014). According to Hockey's (1993) model of compensatory control, performance in spite of high demands can be protected by sympathetic activation, increased effort or both. Other strategies to address high work demands are a decrease in task performance and fatigue after-effects (Hockey, 1993; Hockey, 1997). For example, planning and decision-making demands, as well as learning demands that arise in the face of high autonomy, require increased effort (Kubicek et al., 2014).

Likewise, the effort-recovery model postulates that dealing with task demands is strenuous at all times and therefore always requires a certain amount of effort (Meijman & Mulder, 1998). When work demands exceed the individual work potential, as is the case in work overload, physiological, behavioral and subjective load reactions are a consequence, eventually resulting in decreased well-being and health. This reaction can be buffered by decision latitude, or autonomy (Meijman & Mulder, 1998). However, when autonomy is accompanied by the requirement to design one's own job, which imposes yet another job demand, the positive effect of autonomy may be impaired. Korunka and Kubicek (2013) concluded that the possibi-

lities that increased autonomy offers are ambivalent. On the one hand, it offers the opportunity to work in a self-determined and therefore humane manner. On the other hand, it can bear a risk when individual work design becomes necessary and leads to overload strain (Voß, 1998).

In line with the JD-R model and the effort recovery model, when individual work design involves an increase in effort and in the amount of energy dedicated to plan, organize and coordinate the regular work tasks, it can be considered a job demand, potentially leading to decreased health and well-being. Our aim in this study was to investigate individual work design not only as employees' unsolicited behavior, as in the case of job crafting (Wrzesniewski & Dutton, 2001), but as an inherent requirement to achieve work goals and to ensure long-term productivity, health and employability. Therefore, our main research question was: In what way does high autonomy produce a need for individual work design to cope with the work situation? We subdivided our main research question into two more distinct questions.

1. How do employees engage in individual work design?
2. Can individual work design be considered a job demand?

Method

Procedure & Sample

The research questions aimed to examine participants' efforts of individual work design. They were exploratory in nature; therefore, we used a qualitative approach to data collection and analysis.

We used a semi-structured interview format and developed an interview schedule, assessing participants' work characteristics, their influence upon them and their need to individually design their own job. Interviewees were asked to describe their workplace including typical tasks they perform. Then, we asked questions about participants' degree of autonomy at work and potential influence they had on work tasks and working time. We were able to extract the work characteristics that participants had an influence upon and explored whether they experienced a necessity to design these aspects and whether work design was accompanied by additional effort.

The study reported in this paper is part of a larger research project on individualized work design. Participants were recruited mainly through a large German health insurance company and through three companies, all taking part in the above named research project. We recruited participants who work in very flexible, self-determined and highly autonomous work settings, deciding how, when and where to work. We conducted 41 interviews. Our sample consisted of self-employed individuals without employees and employees with high degrees of autonomy, working rather separately from their organization, for example in project management, abroad, with clients on site, and on the road as sales representatives. Approximately 68 % were male, and the mean age was 43 years. Participants worked 48 hours per week on average. Each study participant was interviewed individually. The interviews lasted 60 minutes on average. Participants agreed to take part in the study and signed a consent form. They were assured that we would only present the data in an aggregated and anonymized way. Interviews took place in the spring of 2014, either face-to-face or via phone, and were recorded and transcribed afterwards. They were conducted by 10 trained interviewers. The interview training consisted of information about the interview setting, the attitude of the interviewer towards the interviewee and the handling of difficult and/or sensitive interview situations.

Analysis

Data analysis followed Neuendorf's (2002) approach to content analysis. Because we built on the JD-R model but aimed to broaden the concept of job demands with respect to individual work design, we derived categories inductively and deductively, i.e., applying the concept of job demands to our data, as well as developing new explanations grounded in the data. We established a thematic framework of the work characteristics being designed and the efforts of individual design necessary to cope with the work situation, which we revised and expanded as the coding process continued. We analyzed our data in more detail as we divided our categories into subcategories. Additionally, we counted statements in which study participants mentioned such words as 'effort', 'strain', 'energy', 'time-consuming', 'taxing' and 'costly' in relation to individual work design in order to answer our research question as to whether individual work design can be considered a job demand.

The number of entries in each category was counted for descriptive statistics. Four of the 41 interviews were picked at random and coded by two coders (10 % of the total sample). We calculated intercoder agreement according to the Hayes and Krippendorff criteria (2007). Intercoder agreement was substantial at .76 (Krippendorff's α).

Table 1: Designing work content and working time.

	% (N=41)	Example
Work content		
Working procedures/processes	63	„What I actually do during the day or during one week is eventually up to me“ (Jane, consultant, 31).
Choice of projects/customers	46	„I am relatively free in choosing the projects I work on, how many new projects I take on, and how much money I charge“ (Mary, consultant, 34).
Project planning	39	„You have a certain influence in projects. I have a say in how the project is going to be run“ (Bob, self-employed web-designer, 30).
Promoting one's own career	29	„When I notice my knowledge gaps in some areas or when I notice something coming 'in style', then I have the opportunity to train myself or to attend a training“ (Richard, consultant, 61).
Working time		
Timekeeping	10	„I have a timekeeping tool on my computer. So I always know how many hours I worked for each client. (…) I can keep track of how much money I made working for a client and also how many hours I've worked during the day“ (David, self-employed film maker, 37).
Scheduling	29	„I have deadlines that I have to keep, but how I do that is up to me. As I said, it's management. I have to manage it, so it all works and fits“ (Sharon, sales representative, 52).
Taking individual breaks from work	63	„I usually take breaks, but there are days where I just keep going, but I can completely influence that. I could take a break, but then I'd have to stay at work an hour longer in the evening“ (Adam, self-employed consultant, 45).
Extending working time	68	„There are times when it's just extreme, where I don't have any influence. (…) It's just so much that I work from dusk till dawn, even on the weekends“ (John, self-employed consultant, 40).

Note: Pseudonyms are used in quotes. Quotes are translated from German.

Findings

In total, we developed a code system of 22 codes. All 41 interviewees reported designing aspects of their own job on a regular basis. Thirty-nine of 41 reported having to design their job in order to work efficiently and to stay healthy. Eighteen of 41 reported that their individual work design was accompanied by increased effort. To answer our first research question, we explored whether and how participants engaged in individual work design as part of their job. The interviews clearly showed that employees designed several dimensions of job characteristics on a regular basis. We divided results into individual efforts regarding work content and efforts regarding working time. Table 1 gives an overview of designing work content and working time, including examples.

Designing work content

1. More than half of the participants of our study mentioned having an influence on their *working procedures and processes*, referring to the way they execute their work tasks. Examples include deciding how, when, with whom and where to work, setting up project-specific to-do lists, switching between different projects and eventually creating one's own special way of working and getting tasks done.
2. *Choosing customers and projects* to work on was mentioned by almost half of our sample. Efforts include actively acquiring new customers and prioritizing inquiries as to which customers are considered 'important' in terms of reputation and possible future jobs, thus strategically planning which projects to take and which to decline. Additionally, participants mentioned taking on and declining projects as being an act of balance be-

tween avoiding work overload while also avoiding turning down important clients and feeling financially secure. This behavior was particularly pronounced in self-employed individuals.

3. The *planning of projects* was another behavior mentioned by 39 % of the participants. To some extent, participants were able to influence the magnitude of projects, i.e., either expanding or narrowing down projects. They could change the order in which tasks were completed and influence work scheduling. They were able to manage and address time delays, eventually engaging in time management.
4. *Promoting one's own career* is a behavior almost one-third of our sample mentioned. It refers to participants' control over their own professional development. They must expand their expertise and knowledge actively in relevant fields through research and self-training. They always must be up to date in terms of trends and new procedures. One interviewee stated: „There are these trends, developments and all of a sudden it's irrelevant, the programming language (…). People have to relearn completely. And that's something you need to be aware of, that you have to be up to date constantly" (Bob, self-employed web designer, 30 years).

Designing working time

Approximately 56 % of our sample reported making use of time autonomy. For example, time autonomy might be used for personal reasons, such as taking care of children or adjusting the working hours to one's personal circadian rhythm. Interestingly, some interviewees reported having a great deal of working time autonomy but not really making use of it. Data analysis revealed different efforts related to working time.

1. *Time keeping* was only exercised by a small amount of participants (10 %). One interviewee used a time-keeping tool, helping him to gain knowledge on how many hours he worked for each client.
2. Almost one-third of our participants mentioned designing their own *scheduling*. This included coordinating working hours with private time demands and coordinating appointments so that travelling and waiting time is reduced to a minimum, deciding when to attend to which tasks, keeping deadlines in mind and prioritizing tasks.
3. Approximately 63 % of our interviewees reported *taking individual breaks from work*. Due to the great autonomy experienced by our participants, breaks can be planned and taken individually. Behaviors include taking regular lunch breaks, using breaks to recover from work, to have time for personal matters, to spend time alone and, interestingly, to work on routinized tasks. Additionally, breaks are omitted in times of high workload. When working with clients on site, taking breaks seems to be particularly hard. One consultant asked: „The question is, what exactly is a break? Am I only taking a break when I completely detach from work or am I also taking a break when I talk to a colleague?" (Eric, consultant, 47 years).
4. *Extending working time* was the most frequently mentioned behavior, named by more than two-thirds of our sample. Extending working time refers to working overtime, working on the weekends, working during vacation and being available for work matters after hours through electronic devices. It was primarily used to cope with job demands such as time pressure and a high workload.

Individual work design as a job demand

After looking at the dimensions of job characteristics that employees designed on a regular basis, our second research question was: Can individual work design be considered a job demand? To answer the question of whether individual work design was necessary and therefore constituted a job demand accompanied by increased effort, we included all statements in which interviewees clearly mentioned *being forced* to engage in individual work design and *having no other choice* but to design, indicated by such words as 'must', 'have to' and 'otherwise xy would happen'. We extracted three major reasons to engage in individual work design: (a) *to ensure work effectivity*, (b) *to ensure long-term professional success* and (c) *to preserve internal resources*. Table 2 gives an overview of our main results.

Design efforts to ensure work effectivity

Our sample reported having to use different strategies to work efficiently and to reach work goals throughout the working day.

1. Efforts to design *working procedures and processes* include planning projects and delegating tasks. Two specific ways in which work procedures must be designed are *prioritizing* tasks and scheduling time. Participants mentioned having to use programs such as Google Calendar®, cloud computing and Dropbox® to manage their time, to set appointments and to work simultaneously on dif-

ferent projects. This task planning and keeping track of meetings and deadlines is experienced as a burden or „lost time“ (Harry, self-employed journalist, 31) because it is usually not paid. However, without making decisions on how to design work procedures efficiently, the quality of one's work would suffer due to losing track of tasks to be done and deadlines to be met.

2. *Influencing work quality* refers to such efforts as lowering the quality of one's work and keeping perfectionism to a minimum in order to work in an economically efficient way. This becomes particularly important when faced with time pressure, when deadlines are close and time is limited.
3. *Creating self-motivation* is a behavior aimed at increasing self-discipline, staying involved and

Table 2: Design efforts of individual work design.

	% (N=41)	Example
Design efforts to ensure work effectivity		
Working procedures/processes	66	„The things you don't talk about (with clients) in the beginning (of a project) can potentially cause problems later on“ (Ben, consultant, 35).
Prioritizing tasks	32	„Some medical practices are more promising when it comes to buying than others. And when I'm in a medical practice which is rather reluctant to buy and they keep me waiting for two hours, then I'll try to postpone the appointment“ (Michael, sales representative, 35).
Scheduling	59	„The freedom (of being self-employed) is accompanied by the need to organize yourself. I have to be very disciplined with myself, because I don't have a set framework of office hours or the presence of co-workers or meetings I have to attend“ (Harry, self-employed journalist, 31).
Influencing work quality	10	„Sometimes I'll say 'I know it's not great, but let's just leave it at that'. My client will never know because he's never seen the better version and he'd probably not spend more money on the better version anyway, so at some point it's all about thinking economically“ (Tom, self-employed marketing consultant, 32).
Creating self-motivation	7	„You really have to get involved, without anyone supporting you and telling you what to do. You have to be able to motivate yourself. It's hard“ (Bob, self-employed web designer, 30).
Extending working time	34	„Two years ago, on Easter, I had to write an offer for a client. I completely blew off Easter, my family went visiting relatives and I sat here working. That was very annoying. And I try to avoid that“ (Adam, self-employed consultant, 45).
Design efforts to ensure long-term professional success		
Acquisition of projects/customers	32	„It is an effort to submit an offer, which you have to prepare and you work on that for one or two days and you don't get paid for that“ (Jane, consultant, 31).
Promoting one's own career	29	„It's all about being updated, because there's much competition. (…) You can easily become dispensable“ (Jenny, self-employed journalist, 57).
Financial management, formalities	20	„You have to keep track of your financial situation. Managing that is extremely important. And it might be the biggest problem. As soon as an existential fear hits you, (being self-employed) is probably the worst in the world because you'll feel like a beggar“ (David, self-employed film maker, 37).
Shaping relationships		
With co-workers	34	„I have a few co-workers who also work as consultants, and we talk almost every day, give ourselves feedback, acquire new clients together“ (Adam, self-employed consultant, 45).
With clients/customers	34	„Of course you have to respond to the other person. That's the most important thing when doing business. To know what kind of person he or she is, concerning the kind of language you use, right?“ (David, self-employed film maker, 37).

	% (N=41)	Example
Design efforts to preserve internal resources		
Deliberately setting limits to working time	46	„If you work too much, your head is overloaded. Then, you have to take time off and spend it with your family and friends“ (Richard, consultant, 61).
Taking individual breaks from work	12	„You have to make sure that you eat something during the day while you're away on business. You have to plan that, and really it's additional effort planning that, but it's necessary“ (Michael, sales representative, 35).
Keeping life-domain balance	56	„I have to take care of my wife, I have to make sure I'm not stressed and still have enough time for the rest of the family. And we can't live off my wife's sick-pay so I have to bring home some money. So, I really have to find my balance“ (Richard, consultant, 61).

Note: Pseudonyms are used in quotes. Quotes are translated from German.

motivating oneself in spite of obstacles. Interviewees mentioned having to motivate themselves, especially when working on boring routine tasks, working on projects they find unexciting and working with clients they do not like.

4. *Extending working* time is used as a resource to stay productive and cope with job demands in times of time pressure and a high workload due to deadlines. In this case, working time must be expanded into the evening and night hours, as well as into the weekend and even vacation time, in order to finish work tasks and eventually meet deadlines, fulfill clients' needs and therefore ensure employability through potential future orders.

Design efforts to ensure long-term professional success

Next to using strategies to work efficiently, interviewees expended efforts to ensure long-term professional success. They acquired new projects and customers, they promoted their own career and they engaged in financial management.

1. *Deliberately choosing projects and/or customers* is an important work design behavior in which interviewees engaged. To ensure long-term employability and a financially secure future, participants must actively acquire new clients or decide which projects to take on and which to decline. They based their decisions on how much money was involved, whether they considered future orders likely and whether declining an offer would entail losing an important client. This behavior was particularly pronounced in self-employed individuals.
2. The acquisition of customers goes along with the requirement to *promote one's career*. Choosing or declining projects also has an impact on one's career development. Participants mentioned having to choose the projects they work on according to how trendy or in-style they were, whether they fit one's portfolio and could potentially be used as a reference for future clients. Additionally, promoting one's career included planning one's professional development, engaging in further training and managing one's knowledge to stay updated on new developments in the field. Allvin et al. (2011) referred to these demands as cognitive knowledge demands. They postulated that the individual himself is responsible for ensuring lifelong learning to fit one's own knowledge to the demands of the labor market.
3. As a strategy, *financial management* refers to such behaviors as monitoring one's financial situation, book keeping, considering how much money one must earn to make a living and whether one must work ahead to save money for economically worse times. Dealing with these formal aspects of the work situation was accompanied by extra effort and therefore was very unpopular in our sample. This behavior was particularly pronounced in self-employed individuals.
4. Next to content-related aspects of the job, interviewees mentioned having to *shape their relationships to co-workers and clients*. Co-workers were seen as a resource to get feedback, to talk about working procedures and to acquire new clients together. Shaping one's relationship to clients was considered important in order to create a pleasant work atmosphere, to be able to respond to customers' needs and to sell one's product. Goals, roles and forms of communication must be discussed in advance to ensure a smooth working

process. One interviewee said: „Working in consulting means working in relations. These can be challenging, socially demanding, and intellectually complex“ (Tim, consultant, 44).

Overall, engaging in these strategies was necessary for interviewees to work efficiently and to ensure long-term professional success. Without expanding these efforts, they would potentially risk their own employability and financial basis due to a lack of productivity. Work procedures might be ineffective without prioritizing tasks and scheduling time, not adjusting one's working time to the current work load could result in missing deadlines and aggravating clients, and avoiding finances and formalities could potentially lead to undesired additional payments.

Design efforts to preserve internal resources

Next to the above-mentioned work-related efforts, interviewees employed methods to preserve internal resources and were required to stay healthy and productive in the long run. They set limits to their working time, they took breaks from work and they worked on their life-domain balance.

1. *Deliberately setting limits to working time* was important in order to preserve internal resources, to promote well-being and to make room for recovery experiences. Examples include planning social activities in the evening in order to limit working time and keeping working time in a set time frame – not working more than ten hours a day, for example – to prevent work overload and extreme exhaustion.
2. In a similar manner, interviewees were required to *take individual breaks from work* in order to stay productive and healthy during the workday. Efforts included making room for and planning lunch breaks intentionally and making sure to eat enough during the work day, especially when on the road.
3. *Keeping a healthy life-domain balance* is another important behavior that participants engaged in to find time for family and friends and to find compensation for the time spent at work. One interviewee stated: „Keeping a balance between my work life and my private life, I really see that as my job“ (Patrick, self-employed consultant, 35). One way to increase life-domain balance was to set clear boundaries between the work and the private life domain using boundary management strategies, for example. Boundary management refers to setting limits to one's working time, thereby demarcating the line between working and private time (e.g., Kossek, Noe & DeMarr, 1999; Kreiner, Hollensbe & Sheep, 2009). Strategies include establishing rituals to draw a line between work and private time, deliberately rejecting work-related calls or e-mails after hours, having fixed office hours or blocking time frames for private matters only. One interviewee said: „(…) to distinguish between work and leisure time – especially when you work at home – is to simply buy a pair of shoes that you only wear at home. You put it on in the morning, take it off at night, saying 'now is my time off'. It really helped“ (Bob, self-employed web designer, 30).

For interviewees, deliberately setting limits to working time, taking individual breaks from work and keeping a life-domain balance were indispensable ways to make room for recovery, relaxation, and leisure activities. Without these efforts to set limits to working time, take breaks from work, and actively working on their life-domain balance, they would potentially experience symptoms of work overload, exhaustion, fatigue and role conflicts in balancing their work and their private life.

In sum, the above-mentioned efforts of individual work design seem to be important to stay healthy and to work efficiently. We were able to demonstrate that individual work design was accompanied by increased effort and experienced as an additional necessity one must deal with in order to complete regular work tasks. We looked at statements in which study participants mentioned such words as 'effort', 'strain', 'energy', 'time-consuming', 'taxing' and 'costly' in relation to individual work design. According to this analysis, 18 out of 41 participants experienced an increase in energy they had to dedicate to individual work design. Employees experienced the time spent on individual work design as „lost time“ (Harry, self-employed journalist, 31). They mentioned an increase in effort and energy in order to plan, coordinate and prioritize tasks. In this sense, individual work design can be considered a job demand because it requires additional effort to plan and coordinate.

Discussion

Judging from the results presented in this study, high autonomy can lead to the requirement to individually design one's job. Due to unpredictable working conditions and no reliable framework in which work is being executed, individual work design becomes indispensable. These flexible working conditions force employees to design their job in order to work efficiently, to achieve objectives and to maintain sustainable productivity and health. Thus, our study showed

that autonomy can have a demanding side when it goes along with the requirement to design one's work, creating additional effort next to regular work tasks and potentially leading to stress. We looked at very autonomous and flexible working environments and discovered which task and time characteristics individuals designed on a regular basis. We found that individual work design in these jobs with very high autonomy was necessary and therefore constituted a job demand. In line with Warr's (1987) Vitamin Model, when high autonomy goes along with a need for decision-making, high degrees of uncertainty and high responsibility, individuals might eventually experience overload strain. Taking Hockey's (1993) model of compensatory control and the effort-recovery model (Meijman & Mulder, 1998) into account, when individual work design becomes indispensable next to working on the regular work tasks, the demands imposed upon the individual rise and require an increase in effort to meet short-term and long-term work-related goals. Following these results, we define individual work design as the demand to design one's job characteristics in a way that enables long-term healthy and productive working, ensuring sustainable employability.

When dealing with individualized and autonomous forms of work, it is necessary to distinguish our concept of individual work design from other forms of self-initiated behavior, such as (a) job crafting (Wrzesniewski & Dutton, 2001), (b) self-regulation (e.g., Vancouver, 2005) and (c) self-leadership (e.g., Manz, 1986).

First, as opposed to the opportunity to craft one's job, individual work design in itself might be a requirement, inherent in the job, leaving employees no other choice but to craft their jobs because there are no distinct tasks or procedures given (see above).

Second, self-regulation is defined as „the processes involved in attaining and maintaining (i.e., keeping *regular*) goals, where goals are internally represented (i.e., within the *self*) desired states" (Vancouver & Day, 2005, p. 158). In particular, these processes involve goal establishment, goal planning, goal striving and goal revision (Austin & Vancouver, 1996). Self-regulation describes the process by which individuals relate their goals to their expenditure of effort and to their current state of goal attainment. It is a feedback process providing individuals with information about the discrepancy between reality and desired future, eventually enabling individuals to modify their strategies of goal attainment, if necessary (Vancouver & Day, 2005). Thus, self-regulating processes must occur in order to ensure effective individual work design. When planning and coordinating aspects of the job, self-regulation is an essential component to successfully achieving work-related goals. We consider it a necessity for successful individual work design.

Third, self-leadership is a specific form of self-regulation and includes bringing oneself to perform both naturally motivating tasks as well as tasks that are not naturally motivating (Manz, 1986; Markham & Markham, 1995). It consists of behavioral-focused strategies, natural reward strategies and constructive thought pattern strategies (Prussia, Anderson & Manz, 1998).

Of the above-mentioned constructs, self-leadership is the most strongly related to individual work design. However, individual work design is conceptualized as a job demand, representing a necessity, whereas self-leadership, just like job crafting, has been described as self-initiated behavior in the literature (e.g., Pearce & Manz, 2005).

When looking at the working conditions our sample reported, the question arises whether we can still speak of autonomy when jobs formally high in autonomy become more and more restricted by external factors, such as clients' demands, deadlines and time pressure, resulting in the requirement to be flexible (Höge, 2011; Korunka & Kubicek, 2013). In our study, we discovered that our sample of highly qualified and very autonomous and flexible workers only experienced individual autonomy to a certain degree. Much of the formally given autonomy could not be used for individual purposes but had to be used to fulfill work tasks, to please clients, to meet deadlines, to cope with time pressure and to eventually secure one's long-term productivity and employability. An increase in autonomy can particularly lead to overload strain when flexibility increases and organizational guidelines, frameworks and control decrease, combined with a higher pressure to perform well at work. The newly gained decision latitude could lead to symptoms of overload or burnout when setting organizational goal setting becomes unrealistic (Korunka & Kubicek, 2013). Therefore, it is necessary to take a closer look at the highly praised concept of autonomy: We need to consider whether autonomy is merely formally present or actually available and useful for employees. When examining autonomy, scholars should be aware of the fact that in certain work environments, workers may not be able to make use of their autonomy for individual purposes, but are forced to use it to react to external demands. Therefore, future studies should also assess the degree to which autonomy can be used for individual purposes, asking whether autonomy offers the possibility for the satisfaction of needs.

High autonomy can present a downside in that it gives rise to the demand for individual work design; we may then ask ourselves whether work design interventions that focus on increasing autonomy continuously in different kinds of jobs is really a promising solution. The advantages of strict guidelines, rules and hierarchies at work should not be underestimated be-

cause they have the ability to decrease complexity and relieve employees from overtaxing responsibility and uncertainty (Baecker, 1999).

When autonomy is high, however, according to the buffering hypothesis of the JD-R model (e.g., Bakker & Demerouti, 2007), resources might help in coping with the demand for individual work design. These resources could comprise competencies in individual work design, such as being able to plan and organize tasks, to schedule working time according to task characteristics, and acknowledging and making room for recovery and leisure activities.

Whenever employees feel like they cannot oversee the dimensions of a new project or clients' demands are changing constantly, it is necessary to keep these influences to a minimum. This can be achieved by preventive actions, such as strategic project management, explicit communication rules, and realistic deadlines. Additionally, emotional and instrumental support by colleagues and supervisors is an essential resource at work and may help employees cope with a required increase in speed and work intensity (Korunka & Kubicek, 2013). An individualized health intervention program could enable and encourage individuals to design their own job in a healthy and productive way by means of communicating, practicing and strengthening expertise in strategies of healthy work design.

A quantitative approach with a larger representative sample is necessary to confirm our findings. Furthermore, more men participated in our study than women, which might be because women are still underrepresented in the flexible and autonomous jobs we examined (Fischer, Dahms, Bechmann, Frei, & Leber, 2009). The results might therefore only be applicable to women in a limited way. Finally, we did not code events in which employees did *not* have the possibility to design their own work or instances in which they *did not have to* design it due to infrequency. Incorporating these statements might help understand jobs high in individual work design better by distinguishing them from jobs low in individual work design.

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Modeling self-determination in employee responses to work

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ABSTRACT

Based on self-determination theory and models of demands and resources at work, path analysis of survey data (N = 1008) was used to test a model of motivational and health-related responses to work characteristics. Work-related resources and stressful demands were framed as features that facilitate, respectively constrain the fulfillment of basic psychological needs for autonomy, competence, and relatedness. Motivational and health impairment processes were represented by distinct first-order (work motivation, work strain) and second-order outcomes (affective commitment, psychosomatic symptoms). Workplace alienation was confirmed as a shared second-order outcome of low motivation and high strain. Individual autonomy orientation affected employee responses as expected. Limitations, theoretical issues, and implications for work design are discussed.

Keywords

Self-determination – demands – resources – motivation – health impairment

What makes work motivating and rewarding or stressful and health-impairing are core questions of work design (Hacker & Sachse, 2014). Classic answers are offered by the job characteristics model (JCM) and the job demand-control model (JDCM). According to the JCM (Hackman & Oldham, 1976), determinants of work motivation are job autonomy, feedback from the task, skill variety, task identity, and task significance (Fried & Ferris, 1987). The JDCM (Karasek, 1979) emphasizes health-impairing effects of job demands, especially when combined with a lack of personal discretion and social support (van der Doef & Maes, 1999). The more recent job demands-resources model (JDRM) integrates positive and negative perspectives (Bakker & Demerouti, 2007; Schaufeli & Bakker, 2004). *Job demands*, such as work overload, conflicting requirements, and social stressors, are defined as factors that interfere with the attainment of work goals and incur psychological and/or physical efforts and costs. *Job resources*, such as autonomy, learning opportunities, and social support, are deemed helpful in attaining work goals, coping with demands, and achieving learning and growth. Demands and resources are assumed to evoke distinct responses (Schaufeli & Bakker, 2004). Accordingly, resources stimulate a motivational process, inducing positive states and attitudes, such as work engagement, whereas demands trigger an effort-driven process, leading to burnout and impaired psycho-physical health. Research on the JDRM has been prolific, but not without limitations. Similar to the JDCM, the JDRM postulates interactive effects of demands and resources (Bakker & Demerouti, 2007). Cumulative evidence for such interactions, however, has been judged as inconsistent (de Lange, Taris, Kompier, Houtman & Bongers, 2003; van der Doef & Maes, 1999). Treatment of demands and resources as aggregated higher-order factors holds disadvantages with regard to heterogeneous factor composition across studies, abstractness of results, and resulting ambiguity with regard to specific work features. While existing research strongly focuses on burnout and its conceptual antipode, work engagement, alternative motivational and strain-based outcomes have largely been neglected. Finally, the JDRM lacks a strong theoretical basis (Bakker & Demerouti, 2007). Well-established in social psychology, Self-determination theory

(SDT), has been suggested as a complementary framework (van den Broek, Vansteenkiste, de Witte & Lens, 2008). Yet, so far, the integration of JDRM and SDT as well as the uptake of SDT in work design research in general has been limited (Gagné & Deci, 2005).

In this study, core assumptions of JDRM and SDT are integrated and tested in a path model based on survey data of N = 1008 public employees. Unlike mainstream JDRM research, which typically investigates interactive effects of broader bundles of job demands and resources, SDT is used to expound on the *differential* consequences of specific work features. Job resources and demands were framed as work characteristics that support, respectively constrain the fulfillment of psychological needs for autonomy, competence, and relatedness. Motivational and health-impairment processes were represented by first-order (intrinsic work motivation and psychological work strain) and second-order (affective organizational commitment and psychosomatic symptoms) outcomes. Autonomy orientation was included as an individual disposition and workplace alienation as a shared second-order outcome of negative motivational and strain responses. Advancing the integration of JDRM and SDT contributes to theory building. Drawing on an alternative taxonomy of demands and resources and a different set of motivational and health-related outcomes, the dual-process assumption is extended beyond the dichotomy of burnout and engagement.

Hypotheses

Motivational Process

Intrinsic motivation refers to the extent to which behavior is driven by spontaneous interest and satisfaction derived from an activity (Gagné & Deci, 2005). Employed work is first and foremost externally motivated, but task characteristics and contextual features can stimulate „quasi-intrinsic“ or „autonomous“ work motivation (Humphrey, Nahrgang & Morgeson, 2007). Organismic integration theory, a sub-theory of SDT, describes how external control is transformed into more autonomous regulation through psychological internalization (Ryan & Deci, 2000). Progressing from extrinsic to introjected, identified, integrated, and intrinsic motivation, external motives are personally accepted, valued, and assimilated into the self-concept. Self-determined work motivation thus refers to the extent to which work goals are internalized and work activities are autonomously regulated (Baard, Deci & Ryan, 2004; Lam & Gurland, 2008). Basic needs theory, the most central component of SDT, postulates that internalization is a function of the experience of autonomy, competence, and relatedness (Ryan & Deci, 2000). By facilitating these experiences, job resources can thus be framed as conditions that support the fulfillment of these basic needs (van den Broek, et al., 2008). In the present study, work characteristics chosen as job resources were: a) *Task autonomy* (discretion and freedom in how to carry out the work); b) *learning opportunities* (possibilities to develop new knowledge, skills, and abilities); and c) *cooperation requirements* (work-related collaboration and social interaction). Promoting self-determined regulation of work activities, these factors can indirectly contribute to generalized forms of involvement in and positive attachment to the workplace, based on the internalization of broader organizational objectives (Gagné & Deci, 2005; Gagné, Chemolli, Forest & Koestner, 2008). Corresponding with SDT, the first hypothesis posits that autonomous work motivation is a proximal (first-order) response to work design that supports basic need satisfaction, whereas affective organizational commitment is a more distal (second-order) outcome in the motivational process.

> *Hypothesis 1: Task autonomy (H1a), learning opportunities (H1b), and cooperation requirements (H1c) will relate positively to work motivation, which, in turn, will relate positively to affective commitment (H1d).*

Health-Impairment Process

Job strain and health impairment represent the dark side of work. Manifestations range from short-term cognitive and affective responses to chronic psychophysical symptoms (Glaser, Seubert, Hornung, & Herbig, 2015; Höge, 2009; Nixon, Mazzola, Bauer, Krueger & Spector, 2011). Impeding the pursuit and/or attainment of work goals, demands or stressors can be framed as conditions that constrain the fulfillment of work-related psychological needs (Oesterreich & Volpert, 1986; van den Broek et al., 2008). Following SDT, for the present study stressors were selected on the basis that they pose hindrances to the experience of autonomy, competence, and relatedness at work. Specifically, this refers to: a) *Work overload* (i.e., pressure to accomplish more work than feasible at a normal and sustainable pace); b) *learning constraints* (i.e., obstacles or lack of opportunity for the use and acquisition of knowledge and skills); and c) *communication problems* (i.e., lack of information required from others to accomplish the work). Based on the JDRM, it was expected that these demands would not primarily erode work motivation, but rather trigger a relatively independent health-impairment process (Schaufeli & Bakker, 2004). According to classic postulates on the etiology of work-related health problems (Frese, 1985),

this process is assumed to progress from cognitive and emotional work strain, experienced in the short- to medium term, to more severe and generalized psychosomatic symptoms in the longer run. Thus, the following first- and second-order outcomes were assumed to reflect a potential health-impairment process.

Hypothesis 2: Work overload (H2a), learning constraints (H2b), and communication problems (H2c) will relate positively to work strain, which, in turn, will relate positively to psychosomatic symptoms (H2d).

Autonomy Orientation

Individual differences are widely assumed to influence both motivational and strain-based processes. SDT's causality orientations theory posits that some individuals are more likely to experience autonomous motivation, based on a dispositional tendency to perceive social contexts as autonomy-supportive and their own actions as self-determined (Lam & Gurland, 2008). Likewise, stress research has long emphasized the importance of related personal characteristics, such as dispositional optimism, generalized self-efficacy, and locus of control, in adopting active and problem-focused coping strategies to constructively deal with adverse situations (e.g., Connor-Smith & Flachsbart, 2007; Jex, Bliese, Buzzell & Primeau, 2001). In addition to facilitating intrinsic motivation, autonomy orientation should also increase resilience to work strain by promoting an active approach to work and inoculating individuals against experiencing situations as beyond their influence (Frese, Garst & Fay, 2007; Martinko & Gardner, 1982). To test these assumptions, autonomy orientation was included as a predictor of both work motivation and strain.

Hypothesis 3: Autonomy orientation will relate positively to work motivation (H3a) and negatively to work strain (H3b).

Workplace Alienation

Work alienation is a classic topic in organizational research. Rooted in the social critique of employment, alienation is also used broadly for various forms of disengagement from the work role due to lacking fulfillment of job-related needs (Hirschfeld & Feild, 2000; Kanungo, 1979). Central to the concept of alienation is the notion of powerlessness, helplessness, or loss of control (Seeman, 1983). In this study, workplace alienation was framed as a form of dysfunctional attachment to the organization, characterized by negative affect and perceived incapacity to enact positive changes or to find alternative employment (Penley & Gould, 1988). An amotivated and adverse psychological state, alienation is suggested as a longer-term response at the intersection of motivational and health-impairment process (Martinko & Gardner, 1982). Specifically, it was expected that workplace alienation would be predicted by low intrinsic motivation and high strain (Banai & Reisel, 2008). Individuals high in autonomy orientation should be less at risk to develop symptoms of disengagement and helplessness, due to their tendency to feel and act in charge of the situation (de Man & Devisse, 1987). The fourth hypothesis reflects these considerations.

Hypothesis 4: Work motivation (H4a) and autonomy orientation (H4b) will relate negatively and work strain positively (H4c) to workplace alienation.

Method

Sample

Analyses were based on a sample of $N = 1008$ German government employees. Participants were tenured civil servants, performing clerical and accounting tasks in different regional branches of the administration, including fieldwork at corporate clients and personal home-offices (Hornung, Herbig & Glaser, 2008). With 27.5 % women were a minority, mean age was 43.56 years ($SD = 8.37$), and 18.8 % worked part-time (less than 40 h/wk).

Measures

Work characteristics. Six 4-item scales were adapted from an established self-report instrument (Büssing & Glaser, 2000; Glaser et al., 2015). Job resources were represented by three scales with theoretical links to needs for autonomy, competence, and relatedness: *a) task autonomy* (e.g., „This work offers discretion to decide how to get tasks done"; $\alpha = .76$); *b) learning opportunities* (e.g., „This work provides opportunity to expand one's theoretical knowledge"; $\alpha = .73$); and *c) cooperation requirements* (e.g., „This work requires close cooperation with coworkers"; $\alpha = .71$). The remaining three scales were selected as job demands (or stressors), assumed to constrain or hinder the fulfillment of respective needs: *d) work overload* (e.g., „Frequently, there is too much work to do at once"; $\alpha = .71$); e) *learning hindrances* (e.g., „There is little opportunity to learn new working methods"; $\alpha = .70$); and *f) communication problems* (e.g., „Information needed to do the work is frequently not available"; $\alpha = .71$). Unless

indicated otherwise, measures used a 5-point Likert scale from 1 = „Not at all“ to 5 = „To a very great extent“.

Work motivation. The 6-item scale by Warr, Cook and Wall (1979) assessed intrinsic or autonomous work motivation. Sample items are: „I feel a sense of personal satisfaction when I do my job well“ and „I take pride in doing my job as well as I can“ (α = .73).

Affective commitment. The 5-item moral commitment scale by Penley and Gould (1988) captured affective attachment to the workplace and identification with organizational goals. Sample items are: „I am dedicated to this organization“ and „It is my personal responsibility to help this organization achieve success“ (α = .73).

Work strain. The irritation scale taps short- to medium-term symptoms of psychological work strain (Mohr, Müller, Rigotti, Aycan & Tschan, 2006). Three items refer to the cognitive component of ruminating thoughts (e.g., „Even at home I often think of my problems at work“) and five items to the emotional component of affective irritability (e.g., „I get grumpy when others approach me“). These two dimensions were combined into a composite measure of cognitive and emotional work strain (α = .89).

Psychosomatic symptoms. Somatic symptoms were assessed with 28 items from the Freiburg Complaint List (Fahrenberg, 1995), based on a 5-point frequency scale (1 = „Never“ to 5 = „Almost every day“). Exploratory factor analysis indicated five symptom domains: *a) general condition* (5 items; e.g., „Do you have a cold? “); *b) tiredness* (7 items; e.g., „Do you feel tired and rundown all day? “); *c) gastrointestinal* (4 items; e.g., „Do you have a sensitive stomach? “); *d) cardiovascular* (8 items; e.g., „Do you have chest pain? “); and *e) musculoskeletal* (4 items; e.g., „Do you have back pain? “). In scale analyses, these factors were included as parcels and, eventually, combined into one index (α = .93).

Autonomy orientation. Orientations towards self-determination were measured with a 9-item control aspirations scale (Frese et al., 2007). Sample items are: „Work is more interesting when you can make a lot of decisions on your own” and „I would rather be told exactly what I have to do. Then I make fewer mistakes“ (reversed) (α = .84).

Workplace alienation. A 5-item scale by Penley and Gould (1988), originally labeled alienative organizational commitment, was used to measure workplace alienation in terms of experienced helplessness and negative affect towards the organization. Sample items are: „No matter what I do around here, this organization remains unchanged“ and „I get angry when I think about this organization“ (α = .73).

Demographic variables. Participants reported their age in years; categorical variables assessed gender (0/1 = male/female) and employment status (0/1 = full-/part-time).

Results

Latent-variable confirmatory factor analysis (CFA) and manifest-variable path modeling were performed with AMOS 18.0 (Byrne, 2001). Full information maximum likelihood estimation accounted for missing data. Applied fit criteria were: Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI) of .90 or higher; Root Mean Square Error of Approximation (RMSEA) up to.08; a narrow 90 % Confidence Interval (CI) for the population RMSEA with an upper bound below.10; Hoelter's Critical N (CN), the sample size for which chi-square would *not* be significant ($p > .05$), of at least 200.

Measurement models are documented in Table 1. A slightly low TLI notwithstanding, the 6-factor work characteristics model (4 items per scale) was acceptable. Discarded were a 1-factor, 2-factor (resources and demands), and 3-factor model (combining scales according to basic needs). A 5-factor model of employee responses comprising 29 manifest indicators (24 items and 5 factor parcels for psychosomatic symptoms) was satisfactory, but not a 1-factor or a 2-factor model (positive and negative responses). Autonomy orientation (9 items) was confirmed as one-dimensional. Except for slightly low values of TLI and CFI, the complete 12-factor structure (57 items and 5 parcels) met standards for acceptable fit. Subsequently, measures were aggregated at the scale level. Descriptive statistics and correlations are provided in Table 2.

Hypotheses were tested in the manifest-variable path model shown in Figure 1. In the baseline model, thirteen paths represented H1a to H4c; ten additional paths assessed possible, yet explicitly not hypothesized results. Effects from all work characteristics were included on *both* first-order responses and from these on *all three* second-order outcomes. Autonomy Orientation was modeled to affect all employee responses. Second-order outcomes were allowed to correlate. Overall, fit indices were acceptable (see Table 1). Confirming H1a, H1b, and H1c, Work Autonomy (β = .10, $p < .01$), Learning Opportunities (β = .09, $p < .05$), and Cooperation Requirements (β =.09, $p < .01$) related positively to Work Motivation, but not to Work Strain (β = .06, β = -.03 and β =.00; all $p > .05$). Supporting H1d, Work Motivation was positively related to Affective Commitment (β = .37, $p < .01$), but not to Psychosomatic Symptoms (β = -.03, $p > .05$). Corresponding with H2a, H2b, and H2c, Work Overload (β = .18, $p < .01$), Learning Constraints (β = .17, $p < .01$), and Communication Problems (β = .09, $p < .05$) were positively associated with Work Strain, but unrelated to Work Motivation (β = .03, β = -.04 and β = -.06; all $p > .05$). In line with H2d, Work Strain predicted Psychosomatic Symptoms (β = .56, $p < .01$), but not Affective Commitment (β = -.05, $p > .05$). Supporting H3a and H3b, Autonomy

Orientation related positively to Work Motivation (β = .10, $p < .01$) and negatively to Work Strain (β = -.12, $p < .01$), but not to Affective Commitment (β =.01, $p > .05$) or Psychosomatic Symptoms (β = -.05, $p > .05$). Negative effects of Work Motivation (β = -.20, $p < .01$) and Autonomy Orientation (β = -.14, $p < .01$) and a positive effect of Work Strain (β = .36, $p < .01$) on Workplace Alienation confirmed H4a, H4b, and H4c.

Three alternative models (Table 1) assessed the effects of a) demographic control variables; b) changing the order of dependent variables; and c) trimming non-hypothesized paths. The controlled model included effects of gender, age, and employment status on all dependent constructs. Six (out of 15) paths were significant. Older workers scored higher on both motivational (Work Motivation: β = .10, $p < .01$; Affective Commitment: β = .18, $p < .01$) and strain-related measures (Work Strain: β = .11, $p < .01$; Psychosomatic Symptoms: β = .07, $p < .05$; Workplace Alienation: β = .11, $p < .01$). Women reported higher Work Motivation than men (β = .12, $p < .01$). Employment status had no influence. Model fit and structural paths were unaffected by the inclusion of controls. In the reordered model, the sequential order of Work Motivation and Affective Commitment, respectively Work Strain and Psychosomatic Symptoms, was reversed. A decrease in fit indicated superiority of the hypothesized order of proximal and distal responses. In the trimmed model, all non-hypothesized paths were deleted, resulting in a (non-significant) increase in the chi-square discrepancy ($\Delta\chi^2(10) = 14.42$ ns), but, overall, a noticeable improvement in model fit. Significance and effects of retained hypothesized paths remained unchanged.

Table 1: Fit indices for confirmatory factor analyses and path model.

	χ^2	df	IFI	TLI	CFI	RMSEA [CI]	CN
CFA Work Characteristics: Hypothesized 6-factor model	932.08	237	.90	.88	.90	.054 [.050-.058]	296
CFA Work Characteristics: Alternative 1-factor model	3130.33	252	.56	.46	.55	.107 [.103-.110]	94
CFA Work Characteristics: Alternative 2-factor modela	2432.50	251	.66	.59	.66	.093 [.090-.096]	120
CFA Work Characteristics: Alternative 3-factor modelb	2939.46	249	.58	.50	.58	.104 [.100-.107]	99
CFA Employee Responses: Hypothesized 5-factor model	1408.80	364	.92	.90	.92	.053 [.050-.058]	293
CFA Employee Responses: Alternative 1-factor model	5899.60	374	.56	.48	.55	.121 [.118-.124]	72
CFA Employee Responses: Alternative 2-factor modelc	4612.07	373	.66	.60	.66	.106 [.104-.109]	92
CFA Autonomy Orientation: Hypothesized 1-factor model	189.35	27	.94	.90	.94	.077 [.067-.088]	214
CFA All Study Instruments: Hypothesized 12-factor model	4409.43	1760	.90	.88	.89	.039 [.037-.040]	425
Baseline Model: Including non-hypothesized paths	139.03	19	.96	.85	.96	.079 [.067-.092]	219
Controlled Model: Including control variables	141.89	19	.97	.84	.96	.080 [.068-.093]	214
Reordered Model: Reversed order of dependent variables	152.00	19	.96	.83	.95	.083 [.071-.096]	200
Trimmed Model: Deletion of non-hypothesized paths	153.45	29	.96	.90	.96	.065 [.055-.076]	280

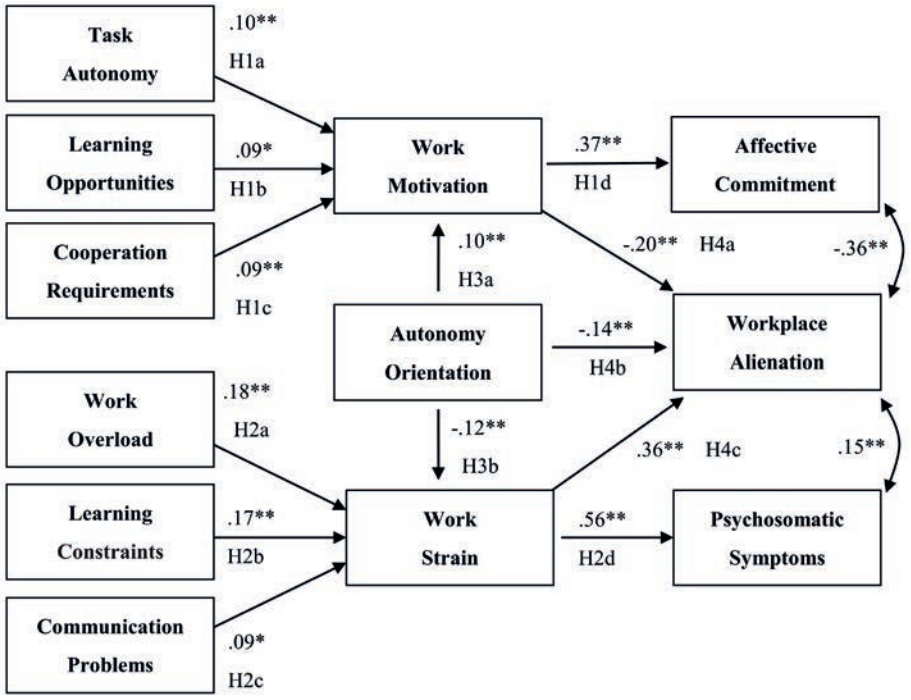
Note: N = 1008; χ^2 = chi-square discrepancy (all $p < .01$); df = degrees of freedom; IFI = Incremental Fit Index; TLI = Tucker Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; CI = 90 % confidence interval of population RMSEA; CN = Hoelter's Critical N; [a]Factor 1: Task Autonomy, Learning Opportunities and Cooperation Requirements; Factor 2: Work Overload, Learning Constraints, and Cooperation Problems; [b]Factor 1: Task Autonomy and Work Overload; Factor 2: Learning Opportunities and Learning Constraints; Factor 3: Cooperation Requirements and Communication Problems; [c]Factor 1: Work Motivation and Affective Commitment; Factor 2: Work Strain, Psychosomatic Symptoms, and Workplace Alienation.

Table 2: Descriptive statistics and correlations.

		M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	Gender	-	-															
2.	Age	43.56	8.37	-.31**														
3.	Employment status	-	-	.53**	-.12**													
4.	Task Autonomy	3.52	0.64	-.16**	.14**	-.15**	(.76)											
5.	Learning Opportunities	3.28	0.70	-.10**	.08**	-.09**	.36**	(.73)										
6.	Cooperation Requirements	2.63	0.74	.13**	-.06	.11**	-.08*	.24**	(.71)									
7.	Work Overload	2.45	0.66	.12**	-.02	.11**	-.31**	-.01	.29**	(.71)								
8.	Learning Constraints	2.29	0.64	.13**	.00	.17**	-.30**	-.12**	.19**	.48**	(.70)							
9.	Communication Problems	2.29	0.63	.13**	-.13**	.14**	-.36**	-.10**	.22**	.69**	.59**	(.71)						
10.	Work Motivation	3.83	0.51	.02	.09**	-.02	.18**	.17**	.08*	-.06*	-.12**	-.12**	(.73)					
11.	Affective Commitment	3.01	0.70	-.06	.21**	-.06*	.18**	.17**	.05	-.05	-.08**	-.14**	.37**	(.73)				
12.	Work Strain	2.37	0.71	-.01	.09**	.01	-.12**	-.06	.10**	.33**	.33**	.33**	.05	-.02	(.89)			
13.	Psychosomatic Symptoms	1.84	0.58	.06	.08**	.08**	-.16**	-.06*	.09**	.29**	.32**	.32**	.00	-.02	.56**	(.93)		
14.	Autonomy Orientation	4.02	0.51	-.16**	.13**	-.10**	.29**	.18**	-.12**	-.27**	-.33**	-.33**	.15**	.07*	-.24**	-.18**	(.84)	
15.	Workplace Alienation	2.26	0.70	-.00	.09**	.00	-.26**	-.11**	.04	.32**	.37**	.39**	-.20**	-.38**	.38**	.33**	-.26**	(.73)

*Note: N = 1008; M = mean; SD = standard deviation; gender (0/1 = male/female) and employment status (0/1 = full-/part-time) are dichotomous variables; values in matrix diagonal (in parentheses) are Cronbach's alpha coefficients; **p < .01; *p < .05.*

Figure 1: Structural path model of self-determination in employee responses to work.



*Note: : N = 1008; standardized estimates (β-weights); **p < .01, *p < .05; not displayed are correlations between independent variables and the following non-significant paths:*

a) From Task Autonomy (β = .06, p > .05), Learning Opportunities (β = -.03, p > .05), and Cooperation Requirements (β =.00, p > .05) on Work Strain;
b) From Work Overload (β =.03, p > .05), Learning Constraints (β = -.04, p > .05), and Communication Problems (β = -.06, p > .05) on Work Motivation;
c) From Work Motivation (β = -.03, p > .05) on Psychosomatic Symptoms;
d) From Work Strain (β = -.05, p > .05) on Organi- za tional Commitment;
e) From Autonomy Orientation on Organizational Commitment (β =.01, p > .05) and Psychosomatic Symptoms (β = -.05, p > .05).

Discussion

General Discussion

This study contributes to work design research by integrating core assumptions of the JDRM and SDT. Work motivation and work strain were confirmed as relatively independent or „dual" processes, triggered by different types of work characteristics (Bakker & Demerouti, 2007). Another purpose was to demonstrate the utility of SDT to inform established models in organizational research (Gagné & Deci, 2005). Work characteristics of task autonomy, learning opportunities, and cooperation requirements were chosen as job resources, based on SDT's postulate that autonomous motivation stems from satisfaction of psychological needs for autonomy, competence, and relatedness (Baard et al., 2004). Work overload, learning constraints, and cooperation problems were selected as work stressors, based on the constraints they impose on the fulfillment of basic needs. Supporting both JDRM and SDT, there was a clear differential pattern in the associations of work characteristics with motivation and strain. According to theory, resources and demands trigger a motivational, respectively health-impairment process. Studies on the JDRM rarely reflect this – typically focusing on work engagement and burnout, but not considering the complex inner dynamics of these multidimensional constructs (Schaufeli & Bakker, 2004). Drawing on an alternative set of proximal and distal employee responses, dual processes of work motivation and health-impairment were explicitly modeled in this study. Accordingly, job resources evoke work motivation, which, via processes of „organismic integration", fosters affective commitment, that is, identification with the organization and internalization of its goals (Gagné et al., 2008). Stressful job demands (job stressors) were related to medium-term psychological irritation, which can progress to more severe psychosomatic symptoms in the longer-term (Frese, 1985). Additionally, results suggest that certain psychological states may manifest at the intersection of the mo-

tivational and health-impairment process. Workplace alienation, as an amotivated and aversive state of experienced powerlessness and negative affect towards the organization, was established as a consequence of low intrinsic motivation and high psychological strain (Banai & Reisel, 2008). Lastly, the model supported the relevance of individual orientations towards control (Lam & Gurland, 2008). Framed as employee aspirations to exercise control and work in a self-determined way, autonomy orientation reinforced work motivation and reduced the risk of work strain and alienation (Frese et al., 2007). Intrinsic work motivation and autonomy orientation were measured with established scales, corresponding with concepts of SDT. The convergent validity with the measures used in SDT research, however, was not tested.

Methodological Limitations

Study results may be viewed as „tainted" by the methodological limitations of cross-sectional self-report studies. Expert opinions on common method bias, however, are inconclusive, ranging from „severe flaw" to „urban myth" (Spector, 2006). Presented results provide a snapshot, but dynamics need to be studied with longitudinal designs. Small effect sizes may be explained by range restrictions in a sample of employees doing similar jobs in the same organization (de Jonge & Schaufeli, 1998). Some heterogeneity in work arrangements (e.g., job duties, work locations, working hours), however, introduced a desirable source of variance (Hornung et al., 2008). Therefore, control variables were included only sparingly. This study used a non-representative convenience sample, which is common practice, but threatens external validity. Yet, there was no reason to suspect that results were context-specific. In some cases, fit indices were lower than desirable, but this was a minor issue, attributable partly to the number of included items and structural paths. Manifest-variable path analysis was used as it permits testing more complex models relative to sample size. Alternative model testing did not call initial findings into question.

Theoretical Implications

Job resources and demands (or stressors) were framed as supportive and hindering conditions for need satisfaction. Arguably, need fulfillment (e.g., competence) may also be based on overcoming obstacles and mastering demands (Hornung, Rousseau, Glaser, Angerer & Weigl, 2010). The dichotomy of resources and demands may be overly simplistic and the suggested tripartite taxonomy of work-related resources, learning demands, and job stressors might be more accurate (Glaser et al., 2015). This theory-based taxonomy corresponds with meta-analytic results, distinguishing between resources, challenge demands, and hindrance demands. Currently, it is not clear, if the duality of JDRM can be reconciled with a tripartite taxonomy of work characteristics. To integrate core assumptions of the JDRM and SDT, this study adopted the two-dimensional distinction of demands and resources from the JDRM, along with the three-dimensional taxonomy of basic psychological needs from SDT. Selecting work characteristics according to whether they support or hinder the fulfillment of psychological needs for autonomy, competence, and relatedness has proven useful in this context, but is not without problems. A case in point is cooperation requirements. A construct similar to task interdependence, the need for task-related cooperation was included to represent opportunities for the satisfaction of social needs and its positive motivational role was confirmed (Kiggundu, 1981). Conceptualized as a requirement, rather than an opportunity, need for collaboration arguably reflects more of a „positive demand" than a genuine resource (Hacker, 2003; Hornung et al., 2010). A (small) negative correlation with autonomy and a (larger) positive association with learning opportunities illustrates this ambiguity. Trade-offs between interdependence and autonomy, however, are intuitive and established (Humphrey et al., 2007). This study tolerated this tension, as work characteristics were analyzed at the scale level and not aggregated into higher-order factors.

Practical Implications

The assembled model has practical implications for managing worker well-being and performance. The primary measure to lessen job strain and prevent its progression to more severe psychosomatic health problems is the reduction of work stressors. To promote intrinsic motivation and psychological internalization of organizational goals, work characteristics that provide opportunities to experience autonomy, competence and relatedness appear to be crucial levers. The costs of poorly designed jobs become evident in employees who are disengaged from their work and alienated from the organization.

Employees respond fairly consistently to work characteristics. Yet, due to individual differences, generic work redesign may not yield optimal results. Self-determined employees appear to profit more from opportunities for need satisfaction and are less vulnerable to stressors, possibly by taking own actions to make their work more supportive of their well-being (Hornung et al., 2010). Employees with external control beliefs may need especially supportive conditions

to maintain well-being and stay engaged in their work. Control orientations are subject to change in longer-term processes of occupational socialization. Specifically, proactive attitudes and behavior can be developed through the provision of autonomy and challenging work (Frese et al., 2007; Hacker, 2003). Accounting for individual differences and intrapersonal developments, a promising approach with particular relevance to workforce learning, is to combine broad-based work design interventions with differential and dynamic elements to allow person-specific adjustments.

Conclusion

Combining JDRM and SDT provides a useful framework to organize positive and negative, short- and longer-term, attitudinal, behavioral, and health-related work outcomes. Understanding of the associated psychological processes is vital for the design of effective workplace health and performance management programs. The presented integration was limited to core assumptions of the JDRM and SDT while neglecting other elements, such as interactions of demands and resources in the JDRM or the role of managerial autonomy support in SDT. Presented results thus are preliminary rather than comprehensive and, hopefully, may serve as a basis for future research to build on.

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The behavioral decision-making architecture

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ABSTRACT

Decision-makers in real life often have to deal with different situational influences while making a decision. They don't know the odds of the outcome of different options and thus make their decisions under uncertainty. Moreover, most real-life situations are fast changing and dynamic, and the decision-maker doesn't always know the exact cause of a given circumstance. This intransparency and interdependency of the decision's different elements can lead to a high complexity of the situation (Schroda, 2000) and thus to a difficult decision. Potential consequences are, besides errors, cognitive biases in the decision-making process, which can lead to erroneous decisions. But why do these systematic unconscious effects occur so frequently and what makes them so robust? This paper investigates the mechanisms and processes which lead to biased decisions. Therefore, a Behavioral Decision-Making Architecture model is presented. It takes a closer look onto the interaction between the characteristics of complex situations (Schroda, 2000), the computational architecture of psychological processes (PSI theory, Dörner & Güss, 2013), and the occurrence of cognitive biases (Carter, Kaufmann & Michel, 2007) as well as their behavioral consequences in the decision-making process. The model depicts these processes and provides an approach to explain the unconscious upside (positive influence on motivational needs) of cognitive biases.

Keywords

Behavioral Decision-Making Architecture – PSI theory – Cognitive Biases – Erroneous Decisions – Real-life Decisions

1 Introduction

In everyday life, we come across a lot of decisions, many small ones and some bigger ones. Usually, one would assume that when you do something on a daily basis, you become better at it over time. Consequently, over the years, we should master the art of decision-making, which allows us to make good decisions, especially when they are important. A group of people who should be very experienced in decision-making are managers. A manager's job is, in fact, to take decisions on a frequent basis, so that this amount of practice should enable them to make good decisions without any problems. But reality looks different as the following example shows.

January 19, 2012 marked the temporary end of a 120-year success story. With the filing for insolvency (in accordance with Chapter 11 of the Bankruptcy Code), Eastman Kodak applied for creditor protection. Until the 1990s, Kodak was one of the five most valuable brands in the world. The company, which was founded in 1892 by George Eastman, had a fabulous rise behind and quickly became an entrepreneurial success story. With the introduction of the „Kodak Brownie" in 1900, every photographer could afford a camera for the price of $ 1. The related sale of films secured the company a highly profitable business for a long time. Thus, for the following decades, Kodak was omnipresent in the US and European markets. In 1988, the photo empire had over 145,000 employees and only three years later their sales rose to nearly $ 20 billion (The Economist, 2012).

However, in 2012, the former world market leader was no longer able to pay its suppliers, employees, and partners. What had happened? How could a company, that dominated the photo market with its numerous inventions for over a century, go bankrupt?

In the case of Kodak, a decisive point was the advent of digital photography, which took away a large part of the market share for analog photography. Ignoring this new technology was afterwards called Kodak's „cardinal error of the management board" (Lehky, 2012, p.1). Ironically, Kodak engineer Steven Sasson invented the first digital camera in-house in the 1970s.

When Sasson presented his first functional prototype of a digital camera to the management, they replied: „That's cute – but do not tell anyone about it" (Deutsch, 2008, p.1) – as he later reported to the New York Times. Despite the fact that with a weight of 4 kg and a low resolution, the camera was still far away from mass production, its potential was already emerging. The managers of the Eastman Kodak Company, however, completely underestimated this new business field (dpa, 2012). For this reason, very little had been invested in the digital solution. With a price of $ 20,000, Kodak's first digital cameras were far too expensive for the consumer. Regarding this, a former Kodak manager told the WirtschaftsWoche (Eckl-Dorna, 2010, p.2), „This was further developed, but not further promoted".

Although the company had been facing the digitalization back then, Kodak entered the digital market only in 2004. However, at this time, digital cameras had replaced traditional analog cameras to a large extend and digital cameras themselves were already being threatened by the increasing popularity of mobile phone cameras. In addition, the competitors among them Sony, Fuji, Canon, and Olympus already had a huge share in the market of digital photography. For Kodak, this competitive struggle ended with the filing of the bankruptcy petition (Gödecke, 2011).

Christensen (2013) has raised the question addressing the underlying reasons of such phenomena: Why do market leaders loose their market share in such a significant way? Have they simply been mismanaged for many years? Christensen himself contradicts this assumption: „an alternative explanation, however, is that these failed firms were as well-run as one could expect a firm managed by mortals to be – but that there is something about the way decisions are made in successful organizations that sows the seed of eventual failure"(p. 6). Also, Campbell, Whitehead and Finkelstein (2009), according to the analysis of management decisions, state „the daunting reality is that enormously important decisions made by intelligent, responsible people with the best information and intentions are sometimes hopelessly flawed" (p.2).

How is it possible that experienced and well-trained managers and motivated founders make decisions for which the outcome is sometimes far away from the actual needs? The decline of the Eastman Kodak Company is certainly an extreme case, but it serves as a good example for the impact of wrong decisions. Inevitably, companies all over the world repeatedly make decisions that lead to suboptimal results. The problem is that unforeseeable factors come into play, which influence the results afterwards and couldn't have been prevented (Edwards, 1984). However, in the analysis of wrong decisions there are also cases in which people could have decided in another, perhaps better way. These cases have striking patterns which show up again and again.

Based on the example of the Eastman Kodak Company, the question arises how such decisions can be explained. Let us assume that the managers were well educated, intelligent and wanted the best for the company, how can such decisions happen? Why did they only react when it was already far too late? An explanation along the lines that the managers acted in an irrational way, is too simple and not satisfying. The question is: what are the underlying psychological mechanisms behind this seemingly irrational behavior?

2 Theoretical Background

The reason for such devastating decisions is often based on automatic cognitive processes of the individual decision-maker (Dörner & Güss, 2013; Carter, Kaufmann & Michel, 2007). These unconscious systematically recurring processes are called cognitive biases. This explains why, as Campbell, Whitehead and Finkelstein (2009) notice, experience, intelligence, and good intentions may not necessarily avoid such biases and the associated sub-optimal decisions. Fiske and Taylor (2013) provide a key reason for the occurrence of these biases. They claim that people are cognitive misers. Many decisions, especially in everyday life, happen intuitively (Kahneman, 2003) or through heuristics (Gigerenzer & Gaissmaier, 2011). These time- and effort-reducing decision-making strategies are mostly easy and quick solutions, but can lead to fatal errors if, for example, the surrounding situation has changed. We want to take a closer look at this – as Dörner (2003) calls it – logic behind failures. Therefore, in the following, the important aspects of decision-making in real-life are highlighted.

2.1 Erroneous Decisions

There is a broad interest in the research question why decisions fail. Nutt (2002) states: „Debacles highlight blunders. They offer insights into how a decision can go wrong, why it went wrong, and what changes in decision-making practices could improve the chance of success" (p.8). Thus, failed decisions offer the possibility to deduce the mechanisms of decision-making.

Not every failed decision has the same impact. Therefore, Spychiger's (2008) classification of errors can be applied to the results of failed decisions. On two dimensions, consequence and reversibility, the decisions can be described. The four kinds of errors are clustered as big and bad errors (high consequences and low reversibility), smaller errors, annoyances (low consequences and low reversibility), smaller errors,

bagatelles (low consequences and high reversibility), and noticeable but not tragic errors (high consequences and high reversibility).

When can we say that a decision has failed? Yates, Veinott and Patalano (2003) defined 5 criteria for good decision-making. Due to their theory, an erroneous decision doesn't fulfill one or more of these criteria. The 5 different factors are the aim criterion (the decision is congruent with the former objective of the decision), the need criterion (the decision fulfills the needs of the decision-maker), the aggregated outcomes criterion (the chosen option is the best one in the set of all possible options) and the process cost criterion (the decision needed in a minimal amount of resources).

Real-life decisions are affected by chance or environmental influences and mostly made under uncertainty. So when looking at erroneous decisions, a precondition is, that the circumstances, which lead to the error, could have been influenced, avoided, or predicted by the decision-maker (Zapf, Frese & Brodbeck, 1999). Having enough degrees of freedom to make the decision in another or even better way is another important precondition to classify a decision as erroneous.

Moreover, the needed information must have been potentially available for the decision-maker. Hacker and Sachse (2014) classify erroneous actions due to lack of information, which may be caused by objectively missing information or deficiencies in the usage of available information. An example for deficiencies may be the failure to use available information (overlooking, forgetting, skipping, subjective information reduction and mental capacity limits) or the incorrect usage (at the point of orientation, the design of programs, the fit in actions and the decision-making).

But only looking at the results can be distorting. Good decisions may have a bad outcome and bad decisions may turn out to have good results. Focusing on the outcome doesn't seem to be a mutually exclusive way to seperate good from bad decision-making (Brown, Kahr & Peterson, 1974; Edwards, 1984). As the outcome doesn't perfectly indicate whether a decision is good or bad, the focus lies on the decision process when it comes to assessing decisions. A good decision process increases the chance of getting good results. Error or biases in the process may result in suboptimal output.

2.2 Decision Process

Decision-making can be seen as a process with sequential steps. There are different approaches about how the exact sequence is shaped and which parts are included. Most of the decision process models show the three main phases „Situational Awareness", „Situation Analysis" and „Action" as described in Jost (2001). At first a decision-maker has to be aware that there is a problem and that a decision has to be made. Second, the situation is analyzed with the aim to gain further information. In the third phase, a decision is taken on the basis of the found and weighted information and the result is implemented. Several decision process models follow roughly this structure (e.g., Bazerman & Moore, 2013). The PrOACT (acronym for the core-steps) approach of Hammond, Keeney and Raiffa (1998) has eight elements. The core-steps, suggested by the authors, encompass: problem, objectives, alternatives, consequences, and tradeoffs. Additionally, the last three steps address the role of uncertainty, risk tolerance, and the consideration of linked decisions.

Dörner (2012) describes five steps of a decision-making process (finding objectives, situation analysis, forecast, planning and deciding, action, and self-reflection). Especially forecast is an interesting addition to the aforementioned sequence. It means the anticipation of upcoming events or developments which might be important for the selection of the right alternative. In their seven steps decision process model, Grünig and Kühn (2013) also include the step „Determining environmental scenarios", which has the same purpose.

2.3 Cognitive Biases

As introductory mentioned, the reasons for failed decisions might be errors or biases. The difference is that an error occurs randomly, but a bias in a systematic way and therefore can be prevented. There is a huge amount of literature about cognitive biases (e.g., Kahneman, 2011; Ariely, 2008; Ariely & Jones 2010). Depending on which collection is referred to, there are over 100 types of this „systematic departure from the normative standard of judgment" (Kerr, MacCoun & Kramer, 1996, p.688). Many researchers tried to find logic categories to deal with the different biases. A clear taxonomy divides the biases into categories which put the similar ones together and is mutual exclusive and exhaustive. These groups should differ from the others and should show a higher consistency. The struggle is that there is a lack of agreement on the definitions of biases and their groupings. Most of the taxonomies in the literature sorted the biases along a literature review. The categories represent the origin of their biases or the aspects they have in common. To name a few, with this method, Bhandari and Hassanein (2012) found three categories (Cognitive biases, Affective biases and Conative biases), Stanovich, Toplak, and West (2008) presented four categories (cognitive miserliness, override failure, mindware gap and contaminated mindware), Arnott (1998) developed six categories (Memory biases, Statistical biases, Confidence biases, Adjustment biases, Presentation biases, and Situation biases) as did McFadden (1999; context,

reference point, availability, superstition, process and projection).

Carter, Kaufmann and Michel (2007) identified 76 biases in their literature review. They created a qualitative cluster analysis and grouped the biases with the Q-sort methodology. Finally, the authors assigned the 76 biases into nine categories (Availability cognition biases, Base rate biases, Commitment biases, Confirmatory biases, Control illusion biases, Output evaluation biases, Persistence biases, Presentation biases, and Reference point biases). The following table 1 is based on their meta-analysis.

2.4 Situation Characteristics

What characterizes real life decisions? In which situation do we have problems or struggle with making a decision? Dörner (2003) describes four different aspects which characterize a complex situation: complexity, connectedness, intransparency, and dynamics. Moreover, people often lack of knowledge on how to cope with the situation. In this tradition, Schroda (2000) analyzed construction tasks for engineers and identified six aspects which describe the complexity of a task, namely conflicting goals, complexity, transparency, freedom degrees, dynamics, and required knowledge. Depending on these aspects, a problem can be described as more or less complex.

Higher levels in several aspects leads to a higher complexity of the task. Conflicting goals means that a task has several goals, that can be contradicting. Complexity describes if a problem has dependent sub functions and their number and strength of connection among themselves. The objective availability of infor-

Table 1: Description of Cognitive Bias Categories after Carter, Kaufmann and Michel (2007).

Category of Cognitive Bias	**Description**	**Associated Biases**
Availability cognition bias	Information is judged as more probable due to their cognitive availability.	Availability; Country of origin; Cultural Familiarity; Home; Imaginability; Recall
Base rate bias	The decision-maker ignores the base rates and gives less relevant data more weigh.	Base rate; Recency effect; Subset
Commitment bias	Due to a commitment in the past (time, money, effort, resources etc.), the decision-maker sticks with the option he invested in, even when it is not the best possible option.	Aversion to regret; Concorde fallacy; Endowment; Escalating commitment; Escalation; Loss aversion; Sunk costs fallacy
Confirmatory bias	To confirm ones own hypotheses or opinion about specific facts, only the information are searched which get along with the prior opinion, others are ignored. Moreover, other information is interpreted in the same manner.	Aversion to ambiguity; Bandwagon effect; Belief; Confirmation; Confirmation evidence; Confirmatory; Desire; Fact-value confusion; Halo effect; Prior hypothesis bias; Selectivity; Self-fulfilling prophecy; Wishful thinking
Control illusion bias	Random events are weighted in favor of the accuracy or certainty of the own judgment. Unrealistic assumptions may be the consequence.	Attenuation; Chance; Completeness; Complexity; Conjunction; Control; Correlation; Disjunction; False consensus; Gambler's fallacy; Hot hand fallacy; Impact; Law of small Numbers; Magical thinking; Overconfidence; Planning fallacy; Sample; Similarity; Test
Output evaluation bias	The extend to which past events could have been predicted is overestimated or reasons are misattributed in retrospective.	Egocentric; Hindsight; Rosy retrospection; Self serving; Success; Testimony
Persistence bias	An option is chosen with a higher probability when it has been chosen before.	Habit; Persistence; Status quo
Presentation bias	The presentation of the stimulus material influences the perception of subsequent information in a systematic way.	Contrast; Framing; Frequency/redundancy Issue valence; Mere exposure effect; Mode; Order; Primacy effect; Scale; Search; Series position effect; Von Restorff Effect
Reference point bias	Judgment and evaluations are influenced by initial positions and thus are not adjusted in a sufficient way.	Anchoring and adjustment; Conservatism; First impression; Non-linear extrapolation; Reference; Regression

mation leads to transparency and vice versa to intransparency if the information is not available or accountable. Degrees of freedom are defined as the amount of different attempts of solutions available to the decision-maker. A dynamic problem is subject to temporal changes of a decision's future impact. However, this impact is predictable only to a limited extent. The required knowledge is divided into knowledge about the conditions and methods of processing a problem (Schroda, 2000).

Most of these aspects can also be found in the features of Naturalistic Decision Making (Klein, 2008). Von der Weth (2001) takes individual differences into account. He proposes a description of complexity on three levels. On the job level, objective sources of complexity are analyzed. The requirement level defines complexity in relation to performance prerequisites. In the experience level, the individual representation of complexity is considered.

2.3 PSI Theory

How is the human mind working when solving problems in real-life situations? How does it process information and make decisions? With the PSI theory (named after the 23rd letter in the greek alphabet which is associated with psychology), Dörner presents an architecture of the human mind which attempts to explain human behavior with the interaction of cognition, motivation, and emotion (Dörner & Güss, 2013; Dörner, 1999). He compares the model with other cognitive architectures like SOAR (States, Operators and Results; Newell, 1987) and ACT-R (Adaptive Control of Thought – Rational; Anderson, 1990). The PSI theory differs from the before mentioned models as it attempts to integrate cognitive, motivational, and emotional processes as well as their interaction into one architecture. For a detailed explanation of the model, see Dörner and Güss (2013).

Cognition in PSI is described with quads. Quads are defined as one central neuron that is surrounded by and connected to four other neurons. These four neurons are pointing forward, backward, downward, and upward, respectively. When a need triggers a goal that could fulfill the need, a search process is initiated. The upward neuron looks for contexts that may contain a certain goal (e.g., searching for a restaurant when craving a burger). When the context is found, the backward neuron is activated, looking for successful behavior tendencies from the past to reach the goal. If such a behavior tendency is stored in memory, it can be executed, if not, a new behavior sequence has to be created. This is what Dörner and Güss (2013) describe as planning. „One adjusts to the demand of the situation before the situation actually has happened" (p.306). A more detailed explanation of the quad structure is described in Dörner et al. (2002).

PSI refers to different needs. They can be divided in three categories. Besides physiological needs (need for food, sleep, and sexuality), there are informational needs (need for competence and certainty) and a social need (need for affiliation). Dörner and Güss (2013) postulate that every human motivation can be explained through the aforementioned five needs. In comparison with the findings of Reiss (2004), who identified 16 human motives from a survey with more than 20,000 participants, Dörner and Güss (2013) conclude that these 16 motives can be summarized within their model of five basic needs, namely "existential needs (eating, physical activity, tranquility), sexuality (romance), affiliation (acceptance, honor, social contact, family), certainty (order, savings, curiosity, idealism), and competence (power, status, independence, vengeance)" (p.302).

In PSI, these needs are symbolized as tanks. These tanks have an in- and an outflow. Related positive signals lead to an inflow and thus to a higher level in the specific tank, related negative information in turn can lead to an outflow. Moreover, there is consumption over time – a positive inflow does not have an everlasting effect – so that there is always a continuous drain. On the one hand, a high level in a tank leads to a pleasure signal. On the other hand, a low level or the anticipation of a further loss leads to a displeasure signal. Low levels in the tanks indicate that one or more needs should be fulfilled. According to the motive strength of every specific need, the one with the highest product is selected and becomes the dominant motive (for the detailed calculation see Dörner & Güss, 2013). When talking about needs, we focus on the informational and social needs, which are explained in more detail hereinafter.

The need for competence is described as the extent to which a person feels capable of solving problems in his or her environment (Dörner, 2012). A high level in the tank for competence means active control of the situation and the ability to cope with it (Dörner, Gerdes & Hagg, 2008). The need for competence can also be described as the need for power, control, or autonomy and is related to self-confidence and self-worth (Dörner & Güss, 2011).

The competence tank is filled by the fulfillment of other needs, when the person experiences success, especially in difficult situations, and in general through the perception of efficacy signals. The tank is emptied by failed attempts to fulfill needs and by failure signals in general.

The need for certainty is described as the need for passive control of the environment. That means knowing or being able to predict what is going to happen in

the future and the meaning for the own needs (Brüggemann, Strohschneider & Rek, 2006). A confirmation of ones own knowledge of the future and the elimination of uncertainty is targeted. Also, the need for efficacy of one's actions is described here. The tank is filled when predicted events occur or when an action has expected consequences. It is emptied by events which are unexpected or new or where the probability of occurrence is unknown (Dörner & Güss, 2013).

The need for affiliation is understood as a need for legitimacy signals, which means accordance with the norms of a social group. The need gets higher through the laps of time. The tank is filled with group conform behavior or the feeling of acceptance in the group and from positive signals as a consequence of supportive and/or helping behavior as in general by signals of legitimacy. The tank is emptied when people experience rejection, exclusion or a lack of recognition.

Emotion plays a special role within the PSI theory. It is not seen as a process besides motivation and cognition, but as a psychological macro. This means an overarching model of organization. Dörner and Güss (2013) sum up: „As we will see, motivations determine what must be done, emotions determine how it is to be done" (p.307).

There is a need to explain behavior with emotions. Without them, no model can provide any good prediction. By looking for a satisfactory definition of emotions, Dörner and Güss take a closer look at the work of Ekman (1992, 1999) who proposed basic emotions, and the early work of Wundt (1896), who characterized emotions as states that are organized along three different dimensions (pleasure-displeasure, tension-relaxation, and excitement-inhibition/tranquilization). Dörner and Güss (2013) conclude that the approach of simply dividing emotions into categories (Basic emotions) doesn't provide a sufficient explanation, as this approach does not clarify what emotions really are. In PSI, emotion is seen as a modulation of cognitive-motivational processes in combination with specific behavior tendencies. To explain human behavior, these three entities are inextricably linked. This view of emotion is similar to the one's of Scherer (2009), who defines emotion as "an emergent, dynamic process based on an individual's subjective appraisal or significant events" (p.1307).

The PSI theory was validated by the prediction of human behavior, by the construction of artificial agents (Dörner, Gerdes & Hagg, 2008), by analyzing historical events (Dörner & Güss, 2013), and by experimental comparisons with human behavior (Dörner et al., 2002).

2.6 Synthesis

The decision cases, to which the following model is applied, are erroneous decisions. They are defined as decisions which hurt one or more criteria for a good decision from Yates, Veinott, and Patalano (2003), could have been influenced or prevented (Zapf, Frese & Brodbeck, 1999), and where the needed information had been potentially available to the decision-maker (Hacker & Sachse, 2014). Cases which have high consequences and aren't reversible are the most interesting ones (Spychiger, 2008).

We follow the decision process steps of Dörner (2012) in a slightly adapted way. To uncover the mechanism behind decisions which went wrong, we take a closer look at the systematic occurrence of cognitive biases. Therefore, the taxonomy of Carter, Kaufmann and Michel (2007) provides a good basis. To detect the complexity of situations in real-life and its influence on the decision-making process, the characteristics of Schroda (2000) are used.
With their holistic approach, which integrates cognitive, motivational, and emotional aspects as well as their interaction in one theory, the PSI theory (Dörner, 1999; Dörner & Güss, 2013) provides the fundamental computational mechanisms.

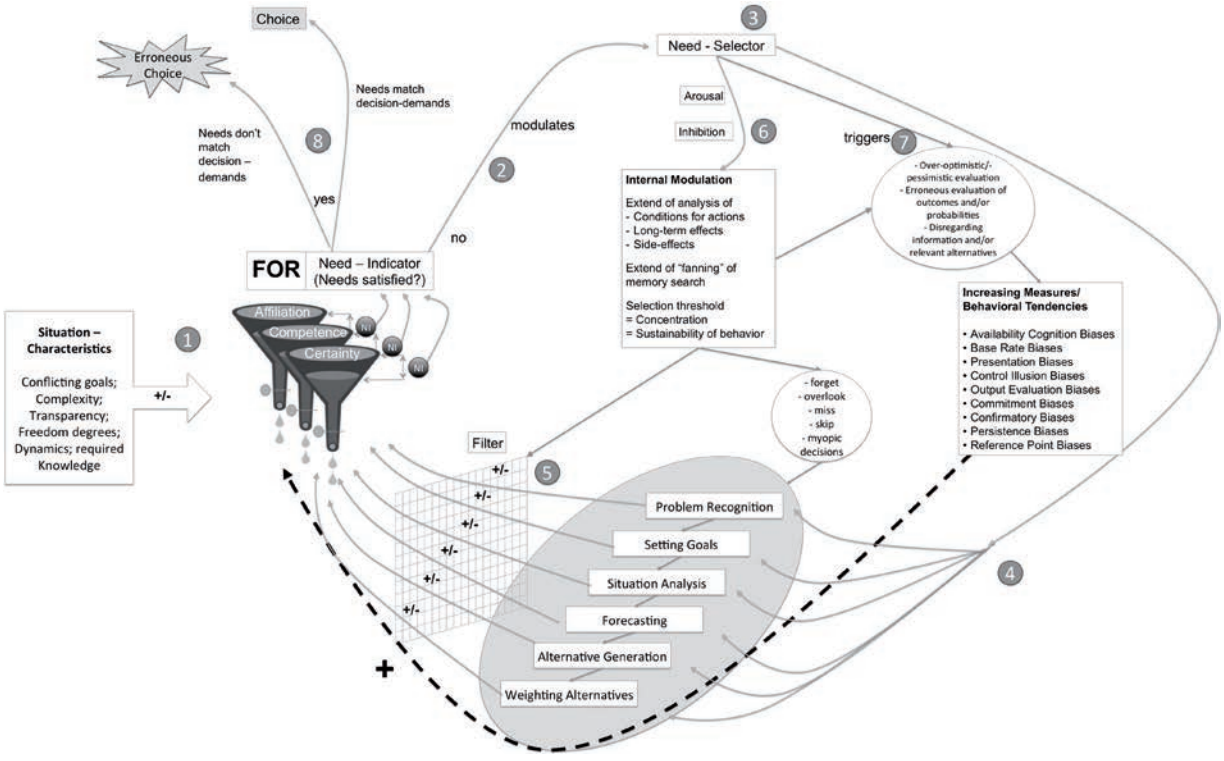
As there is no model, the authors are aware of, which covers all of the above-mentioned aspects and processes of erroneous real-life decisions, the Behavioral Decision-Making Architecture was designed. The goal is to provide a holistic model that describes and explains erroneous real-life decisions. The model integrates important aspects like the influence of the situation on cognitive, motivational, and emotional processes, depicts the dynamic of the decision process as well as the effects of the cognitive biases. In the following, the Behavioral Decision-Making Architecture is described in more detail.

3 The Behavioral Decision-Making Architecture

The present model (Figure 1) attempts to combine the PSI theory and the research on cognitive biases in order to explain the occurrence of erroneous decisions with the interaction of situation, cognition, motivation, and emotion. The goal is to provide an architecture that explains real-life decisions with a negative outcome due to failures – conscious or unconscious – in the decision-making process.

These errors occur due to two reasons (Dörner, 2003; Schaub, 1996). First, there are cognitive reasons. Humans have a bounded processing and a limited memory capacity. This leads them to think economically. The consequence is that complex systems are simplified and steps in the decision process are

Figure 1: The Behavioral Decision-Making Architecture.



skipped. Second, there are motivational reasons. Depending on the kind of information flowing in, the motivational processes are influenced. The most important ones, such as the need for competence, the need for certainty, and the need for affiliation are building different motives. These motives can influence our cognition, and therefore our emotions. In the adapted PSI model (Dörner & Güss, 2013), emotions are seen as a modulation of cognitive-motivational processes equipped with specific behavior tendencies. The influence of needs on the cognition may increase the occurrence of cognitive biases (Carter, Kaufmann & Michel, 2007; Dörner, 2003) – confirmatory biases, control illusion biases, commitment biases etc. – in the decision-making process (Dörner, 2012) with the aim to cope with the uncertainty and complexity of the situation. As a consequence, instead of satisfying the decision's demands, only the fulfillment of personal needs may be addressed by the decision. Biased cognition can be a personal short-term advantage (optimism, protection of competence, keeping up a positive self-perception etc.) – but in the long run, it might lead to suboptimal decisions.

3.1 Description of the Process

The Behavioral Decision-Making Architecture proposes that the process is divided into eight steps (see Figure 1). The following paragraphs explain those steps in more detail. Plus signs mean positive influence, minus signs negative influence (+/-).

1. *Situation-Characteristics*. The characteristics of the situation influence the cognitive needs (+/-), which are represented by the three tanks (Affiliation, Competence, and Certainty). This influence can lead to an inflow (positive information) or to an outflow (negative information). The situation is perceived as more demanding when it contains increasing conflicting goals, connected subfunctions (complexity), intransparency, dynamics, a lot of degrees of freedom and demands of knowledge (Schroda, 2000). According to the levels porposed by von der Weth (2001), the characteristics of the situation are an objective source of complexity.
2. *Need-Indicator*. The context of the situational information gets more important and moreover the meaning for the decision-maker. Due to its complexity, is the situation a threat to the need for competence, as the person is not feeling capable to cope with the situation? In addition to that, is the decision-maker loosing passive control and the ability to predict future events? When other people are involved, the complex decision could also be a threat to the need for affiliation as the status in the group might be in danger. The decision-maker's interpretation of the situation (see

von der Weth, 2001, requirement and experience level) leads to an in- or outflow and thus to a deviation of the level in the different tanks. If the level falls under a specific set point (negative information or consumption over time), a need is indicated. The kind of need depends on the information flowing in. An unsatisfied need also means a displeasure signal for the decision-maker.

3. *Need-Selector*. To satisfy the needs and to fill up the tanks, an actual need is selected out of the several tanks and their combinations. This need or an amalgam of needs become an action leading motive.
4. *Decision Process*. The different steps of the decision-making process are used to reduce the deviation in the tanks from its targeted set point. At first the problem of the situation has to be recognized in order to set goals which should be achieved. Followed by the analysis of the situation. The future development of events is forecasted and depending on this, alternatives are generated and weighted. The steps can be taken sequentially, but as the whole cycle has several recurring phases, some steps might also be left out or skipped. Taking steps back is also possible.
5. *Cognitive filter*. The steps aim at increasing an insufficient present tank level to an aspired higher target level. For example, with more information, uncertainty can be reduced. However, if there is too much information, which the decision-maker can't cope with, uncertainty increases. The cognitive filter can reflect the information from the decision-making process, depending on its resolution level (see step 6). This process of self-reflection can reduce competence and certainty in the short run. However, in the long run, it can increase the level in the tanks as past failures are analyzed and potentially avoided (Dörner & Güss, 2011). Thus, the process itself can lead to in- or outflow in the tanks.
6. *Internal Modulation*. The assessment of information flowing in and the selected need (and thus the indication of a demand) can lead to a modification of the decision-maker's arousal (Dörner & Güss, 2013). This internal modulation depends on the competence (assessment of ones own abilities to cope with the situation), the importance, and the urgency of the current motive, the menace for the own existence and the relative importance of the current motive (Dörner, Gerdes & Hagg, 2008). Low level in the tanks increase the activation, as the uncomfortable situation should be solved as soon as possible. Thus, a higher arousal increases the readiness to act, but also leads to a higher inhibition and a lower resolution level. The resolution level describes the accuracy during the perception of the situation. When its high, the situation is analyzed and compared very precisely, when its low, the situation is detected more roughly. Inhibition is the counterpart of the resolution level. A high inhibition has several affects on planning, like a narrow memory search, a decrease in the number of alternatives, and no adequate attention to long-term or side effects (Dörner & Güss, 2013). Possible consequences are that important aspects are forgotten, overlooked, missed, or skipped for other reasons, and moreover that myopic decisions occur (Hacker & Sachse, 2014). The selection threshold is positively influenced which means that the current motive stays action leading. Thereby, the system is stabilized, as the different motives are not overlapping each other; however, it gets less sensitive to opportunities and threats.
7. *Increasing Measures/Behavior Tendencies*. The chosen needs trigger certain behavior tendencies. To reduce the difference in the motivational tanks or prevent the tanks from further drain, these tendencies work unconsciously and can lead to cognitive biases through overly optimistic or pessimistic evaluations, erroneous evaluations of outcomes, and probabilities and the disregard of information or alternatives (Carter, Kaufmann & Michel, 2007; Dörner & Güss, 2011).
   The subsequent biases take part in the different steps of the decision-making process and can lead to a quick positive inflow (dashed line) in the tanks.
8. *Choice*. When the need-indicator is satisfied, a choice is made. This point is similar to the effect which Thompson, Turner, and Pennycook (2011) call the „Feeling of Rightness" (FOR). It is described as a metacognitive experience which signals if additional analysis is needed (p.107). During a constant monitoring of the process, the motivational tanks can be filled up or emptied. The search continues until a set point is reached and the Feeling of Rightness sets in. Moreover, Ackerman (2014) found out that this set point lowers itself over time, (Diminishing Criterion Model) when no satisfying answer could be found yet. When the satisfaction comes from a close research and a good process, in which every important aspect has been analyzed and weighted, the needs meet the decision-demands, and consequently, a „good" choice – in relation to the decision process – is made. If there is satisfaction, but it is based on biased information the needs don't match the decision-demands (Dörner & Güss, 2013). In this scenario, an erroneous choice can be the consequence.

The model describes a big circle with recurring phases. During a decision, this circle can be run through for several times on its different paths until the tanks have reached their specific set point. The motivational tanks constantly monitor every action. These tanks are influenced externally by the characteristics of the situation and internally by the decision process. The steps of the decision process are mostly conscious ones, while the internal modulation and the increasing measures are unconscious at a large scale. The Behavioral Decision-Making Architecture describes the origins of erroneous decisions within the decision process.

3.2 Behavioral Consequences in the Decision Process

Because of the described reasons for errors when faced with complex situations – bounded capacity of processing and memory, motivational influences – there are behavioral tendencies that can be observed in the decision process (the following examples refer to Dörner, 2003; Detje, 1996; Dörner, 2014).

Frequent errors in the stage of setting goals are the overevaluation of the current motive, encapsulation, repair-service behavior, or the inaccurate or missing setting of objectives. In the first case, a current motive leads to the fulfillment of an unimportant goal, the important one is ignored even when it is relevant. When faced with complex problems, only manageable problems are solved while no attention is paid to the bigger picture. This leads to an encapsulation due to a high level of uncertainty. Another consequence is the repair-service behavior. Only the current problems are solved – more important ones, which aren't urgent yet, are not paid any attention to. An inaccurate or missing setting of objectives and priorities is the reason behind this effect.

A main error is not to build a model of the situation (situation analysis). Thus, the situation and its developments are hard to predict and long-term and side effects are ignored. Simplified models are also problematic when every component of a complex system is reduced to one causing variable. This central reduction leads to an incomplete representation of the problem.

Another main error is the incorrect, simplified or missing representations of the situation. When the complexity is high, a model helps to understand interdependencies between the different parts of the decision and to recognize long-term and side-effects. However, in order to deal with the complex situation, models are often simplified and reduced to one causing variable. This central reduction leads to an incomplete and wrong representation of the problem. In many cases, the confrontation with the situation is avoided and no model is created. But even when there is a model but it doesn't fit the situation, it is often argued that that one's own model is good but the circumstances aren't. This behavior is described as immunizing marginal conditioning. When building a model, the selection of information that is equitable with one's own information can lead to an incomplete representation of the situation. An incomplete representation of the situation leads to a behavior in which symptoms instead of causes are processed.

Besides a solid representation the development of the situation has to be forecasted in order to adjust the decision (forecasting). Complex decisions are mostly dynamic and fast changing. A good forecast attempts to take these aspects into account. A purely linear continuation of the current situation can lead to errors as temporal change and the development of important variables are ignored. Another source of errors – when faced with complexity – is the orientation towards a known variable, while other (unknown) ones are ignored. At last, inappropriate optimism may result in bad decisions. This behavior, resulting from wishful thinking, ignores given probabilities and draws an overoptimistic course of events.

The phase of planning describes the mental anticipation of action steps to reach a certain goal. Within a cross-linked system an action has one or more consequences. These consequences are decisive when it comes to good decisions. A central error in planning is not considering long-term and side-effects or frictions (occurring obstacles in planning). Thus, no alternatives are generated if an option is omitted. Holding on to known planning strategies can also lead to bad decisions. This methodism takes place when familiar strategies are used unreflected to a new situation with different characteristics. If the decision-maker avoids the confrontation with the complex situation, this can lead to what is called a horizontal or a vertical escape.

The horizontal escape describes a behavior that is characterized by a retreat into a well-known field of planning. Thus, unknown and uncertain aspects are ignored. The vertical escape is planning within ones own worldview. Thereby, the planning seems to fit perfectly to the own and biased picture one wants to draw from reality. Another misleading strategy is the intuition actionism. Solely relying on ones own feeling can be a good strategy in an environment that is predictable and has learning potential (Klein, 2008), but in complex situations which don't show these characteristics, this behavior carries the risk of an insufficient decomposition of the problem.

As described in the model, these behavioral consequences and their origins also have positive effects on the self-concept, the feeling of competence and certainty, affiliation to others, the self-protection etc., and

thus serve a reason. This is what makes these effects so robust in decision-making. The problem is when the decision-maker is not aware that these mostly unconscious positive effects take place at the expense of the decision's quality.

4 Limitations

Real-life decisions themselves are complex and have a lot of different influences. Therefore it can be difficult to identify the mechanisms and processes which lead to erroneous decisions. The model does not claim to be a complete representation of the environment and the cognitive architecture. However, it attempts to contain the most important processes in order to depict real-life decisions and the reasons for failure. A retrospective analysis of decisions can be problematic as decision-makers might forget things or reinterpret the situation (Weingardt, 2008). Nonetheless, only afterwards, a behavior can be labeled as erroneous and short- and long-term advantages can be separated. A process of self-reflection can support the insight into the processes leading to a wrong decision (Spychiger, 2008). It will be the focus of another study to reveal the exact relations on how the decision's situation influences the motivational needs. Moreover a deeper look will be taken on the effect of the deviation in the tanks and the occurrence of biases or errors.

5 Conclusion

As described, cognitive biases can influence the motivational tanks and lead to an increased tank level. The question whether cognitive biases are irrational depends on the model they are compared to. In relation to the goal of the decision, cognitive biases in the decision-making process may have the consequence that the goal is not met, even if the decision-maker had the best intentions in mind and wanted to achieve it. According to a rational view of the decision-maker, this seems quite irrational. The cognitive biases, however, fulfill another function. With filling up the tanks of certainty, competence, or affiliation, they keep us in the game in complex and threatening situations. The unconscious usage of biases gives a short cut to the thinking process, is less effortful and fulfills motivational functions associated with the avoidance of uncertainty, keeping up a positive self-image, making a competent impression and thus strengthening the affiliation to others (Dörner, 2003; Dörner & Güss, 2011; Dörner, 2012).

Introductory, we asked for the logic behind the failure of Eastman Kodak's downfall. If we look at this case again from the viewpoint of the Behavioral Decision-Making Architecture, a deeper insight is provided. Kodak's strategy to stick with the analog photography for too long can be categorized as an erroneous decision with high consequences and without reversibility. According to statements in the Forbes Magazine by the former Kodak manager Vince Barabba, the information on the development of digital photography had been present at that time (Mui, 2012). Back then in 1981 – when there was a chance to change the course – Barabba was the Head of Market Intelligence. After Sony launched the first digital camera on the market, one of Kodak's largest retailers asked if they did not worry about the digital photography. Thereupon Barabba conducted a profound analysis and compared the development of the analog with the digital photography.

> „The results of the study produced both 'bad' and 'good' news. The 'bad' news was that digital photography had the potential capability to replace Kodak's established film based business. The 'good' news was that it would take some time for that to occur and that Kodak had roughly ten years to prepare for the transition." (Mui, 2012, p.2)

As it turned out, the management did not use this time properly. Almost eight years later, the CEO Kay R. Withmore announced that his company, which is known for its films in the yellow boxes, will continue to focus on its original core business: „We defined our focus too broadly (...). Now we are focusing on the sectors we want to be in. We are defining what we mean when we say imaging, chemicals and health" (Holusha, 1989, p.2). When he retired, Withmore's successor George MC Fisher still relied on Kodak's established business strategy: „Maybe my real failure is that I haven't communicated how powerful our digitization strategy really is" (Deutsch, 1999, p.2).

The retrospective analysis of this case shows that the information had been available and the decision could have been made in a better way. But when looking at the statements of the CEOs, the logic behind their behavior emerges. The advent of digital photography meant a huge change for the company (threat for the certainty because they couldn't predict what is going to happen). Kodak was world leading in the field of photography (threat for the competence because the analog photography would be replaced), employed a lot of chemists and developers which were specialized in the analog field (threat for affiliation if they are not needed anymore) and had huge chemical installations for the development of the films. What did this situation provoke?

When looking for an explanation, three cognitive biases offer the most elucidation: Confirmation Bias,

Sunk Cost Effect, and Overconfidence Effect. Kodak's leadership ignored the information about the threat and highlighted the advantages of the analog photography (Confirmation Bias). As the leading company in the analog photography, Kodak had invested a lot of resources in this field and therefore ignored the conflicting digital solution for too long (Sunk Cost Effect). Moreover, there was an overestimation of Kodak's strategy regarding the future challenges (Overconfidence Effect). What was the behavioral consequence? Important aspects had been ignored, there was no sufficient consideration of long-term effects and alternatives to the analog photography had been developed far too late.

This behavior had some short-term advantages. The competence was protected and a positive self-image was kept. However, in the long run, it led to the downfall of the company. A comparison of the „Economist" (2012) dramatically highlights this decent: „Strange to recall, Kodak was the Google of its day" (p.1).

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Arbeit!
Ostdeutsche Arbeitswelt im Wandel 1945–2015

Hg. v. Paul Kaiser im Auftrag des
Dresdner Institutes für Kulturstudien und
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Die DDR war eine Arbeitsplatzgesellschaft, vor allem weil ihre Betriebe als „Vergesellschaftungskerne“ begriffen werden können. Die Grundlage für die zentrale gesellschaftliche Dimension der Arbeit wie auch für die weit in das Privatleben hineinwirkende Bedeutung betrieblicher Kollektivität war eine politisch gesteuerte Vollbeschäftigungswelt. In dieser gehörte es zur sozialpolitisch garantierten Selbstverständlichkeit, dass – unabhängig von ökonomischen Kalkülen und der jeweiligen Arbeitsproduktivität eines Sektors – jedermann Arbeit hatte (wenn in vielen Fällen auch nicht diejenige, die sie oder er sich wünschten). Das schloss allerdings auch eine Verpflichtung zur Arbeit ein, die repressiv durchgesetzt werden konnte. Nach dem Zusammenbruch der DDR zeigte sich neben dem fundamentalen Wechsel des politischen Systems der tiefste Strukturwandel im Übergang von einer sozialistischen in eine kapitalistische Wirtschaftsordnung und der damit verbundenen Veränderung der Arbeitswelt. Einerseits handelte es sich dabei um einen dramatischen Sonderfall der Deindustrialisierung in einem traditionell hochindustrialisierten Land, zugleich aber um Veränderungsprozesse, wie sie sich in vielen Regionen der Welt vollziehen, nämlich als fundamentaler Wandel arbeitsethisch begründeter Gesellschaften.

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Beiträge zur Arbeitspsychologie

Herausgegeben von Pierre Sachse und Eberhard Ulich

Pierre Sachse, Eberhard Ulich (Hrsg.)

Psychologie menschlichen Handelns: Wissen & Denken – Wollen & Tun

'Wissen – Denken – Handeln' ist der Name der Arbeitsgruppe, die Winfried Hacker nach seiner Emeritierung an der TU Dresden aufgebaut hat und leitet. 'Wissen & Denken – Wollen & Tun' ist ein Teil des Titels dieser Festschrift, die sich mit verschiedenen Aspekten der 'Psychologie menschlichen Handelns' beschäftigt und Winfried Hacker gewidmet ist.
Die für den ersten Teil des Buches zusammengestellte Bibliografie mit der Nennung von mehr als 700 Beiträgen vermittelt einen Eindruck vom Engagement und der Schaffenskraft eines Autors, dessen Arbeiten die deutschsprachige Arbeitspsychologie seit mehr als einem halben Jahrhundert entscheidend geprägt haben.
Dies wird auch in den folgenden 16 Beiträgen sichtbar, deren Autorinnen und Autoren in unterschiedlichen Zusammenhängen – und zum Teil über Jahrzehnte – mit ihm zusammenarbeiten konnten und in jedem Fall von ihm gelernt haben. Beginnend mit einem Beitrag 'Von der Handlungstheorie zur Aufgabengestaltung' und endend mit einem Beitrag über 'Das Arbeitsgedächtnis als „Nadelöhr" des Denkens' wird ein weites Feld konzeptionell und empirisch bedeutsamer Fragestellungen behandelt und der jeweilige Erkenntnisfortschritt sichtbar gemacht.

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Markus Domeier

Architektur der Fehlentscheidung: Analyse suboptimaler Ergebnisse bei Managemententscheidungen aufgrund kognitiver Verzerrungen

Woran liegt es, dass erfahrene und gut ausgebildete Manager Entscheidungen treffen, deren Outcome teilweise sehr weit entfernt von den realen Anforderungen liegt? Unvermeidlich werden immer wieder Entscheidungen getroffen, die aufgrund von später einwirkenden, unvorhersehbaren Faktoren zu einem suboptimalen Ergebnis führen. Daneben zeigen sich aber bei der Analyse von vermeidbaren Fehlentscheidungen auffällige, unbewusste Muster, die beim Entscheider wiederholt auftreten: sogenannte kognitive Verzerrungen.
Genau hier setzt die vorliegende Arbeit an, identifiziert die relevanten kognitiven Verzerrungen aus realen Management-Fehlentscheidungen und ordnet sie den einzelnen Stufen im Entscheidungsprozess zu. Ziel der Untersuchung ist die Klärung der Frage, ob man kognitive Verzerrungen aus Interviews identifizieren kann, welche Verzerrungen im ökonomischen Kontext überhaupt stattfinden und wo sich die kritischen Punkte im Prozessverlauf befinden. Damit bietet die Untersuchung eine gute Grundlage für einen präzisen Interventionsansatz im Entscheidungsprozess, um zukünftig folgenreiche Fehlentscheidungen effektiver zu verhindern.

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Verena Wagner

Hochwertigkeit von Geräuschen im Fahrzeuginnenraum

Geräusche im Fahrzeuginnenraum sind ein wichtiger Faktor der KundInnenzufriedenheit und haben einen entscheidenden Einfluss auf das „Produkt" Automobil sowie den Qualitätseindruck. Die subjektive Wahrnehmung eines Produktes und dessen Geräusche lassen sich nicht einzig mithilfe technischer Parameter bestimmen; vielmehr ist es für die Produktentwicklung wichtig, technische Spezifikationen mit den Ansprüchen von KundInnen zu verknüpfen. Die vorliegende Arbeit setzt sich mit dieser Herausforderung im Kontext der Automobilbranche auseinander.
Mithilfe von vier aufeinander aufbauenden Untersuchungen wird die Bedeutung von Geräuschen im Fahr-zeug aus KundInnensicht analysiert und der Frage nachgegangen, welche Geräuschmerkmale die wahrgenommene Hochwertigkeit beeinflussen. Um Zusammenhänge aufzuzeigen und Handlungsempfehlungen abzuleiten, werden im Rahmen eines mehrdimensionalen Ansatzes subjektive Bewertungen, akustische Parameter der Geräusche und psychophysiologische Reaktionen der UntersuchungsteilnehmerInnen miteinander in Verbindung gebracht. Die im Rahmen dieser Arbeit entwickelten Bewertungs- und Gestaltungskriterien können wesentlich zur Soundoptimierung des Produktes Automobil beitragen.

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Absenzanalyse im Kontext des betrieblichen Gesundheitsmanagements

Zur Implementierung gesundheits- und persönlichkeitsförderlicher Arbeitsbedingungen sind umfassende, an Stärken und Potenzialen orientierte Konzepte gefragt, wie sie in der betrieblichen Gesundheitsförderung und im betrieblichen Gesundheitsmanagement verankert sind. Darin eingebettete Interventionen erfordern Daten zur Evaluation ihrer Auswirkungen. Den Absenzdaten kommt dabei eine wichtige Funktion zu: Sie liefern objektive Informationen und sind daher ein nützliches Screeninginstrument für die Identifizierung ungünstiger Entwicklungen und Risiken. Die vorliegende Arbeit informiert in prägnanter Form über die für betriebliche Gesundheitsförderung grundlegenden arbeitspsychologischen Konzepte und dokumentiert die Durchführung einer längsschnittlichen Analyse der Absenzen eines Schweizer Versicherungskonzerns über einen Zeitraum von sieben Jahren. Hierzu wurden die Daten gestaffelt nach soziodemographischen Merkmalen ausgewertet und in einem Benchmarking mit Referenzdaten verglichen. Zudem wurden die Auswirkungen von Krisenzeiten im Unternehmen auf die Absenzdaten näher beleuchtet. Die Arbeit vertieft wissenschaftliche Erkenntnisse der Fehlzeitenforschung und liefert praktische Impulse für die Schaffung einer gesicherten Datenbasis zur Implementierung und Evaluation der betrieblichen Gesundheitsförderung.

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What makes humans human? How are body and mind connected, and how are the sciences of the body connected with the sciences of the mind?
Evolution has left its traces on the body and the soul. For this reason, accumulated evolutionary knowledge is a useful and indispensable underpinning for a better understanding of humans: social behaviour, moral consciousness, aggression and the inhibition of aggression, attachment behaviour, learning and intellect, political judgment and activity, behavioural differences due to gender. The interlacing of nature, culture and mind is visible in all realms of humanness/human nature/humanity.
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• "Clear examples enable the reader to better understand the links between human ethology, psychology and philosophy." Barbara Antesberger (2012), *Mitteilungen aus dem Haus der Natur* 20: 106

• "To extend Darwin's theory from morphology to the behaviour of humans and to their 'higher' faculties and mental capacities required extra steps, extra insight, and extra upset. Yet still the different branches of research continue to work in isolation—convenient as it may be, this is not gratifying."—"What I like about this book is that one can learn something from every page—reason enough to recommend it!" Gerhard Vollmer (2012), *Naturwissenschaftliche Rundschau* 7: 379

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Eds.: Wulf Schiefenhövel & Judith Schuler

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Being Human

Bridging the Gap between the Sciences of Body and Mind

Vol. 10
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Was macht den Menschen zum Menschen? Wie hängen Körper und Geist zusammen, wie die Natur- und Geisteswissenschaften?
Die Evolution hat an Leib und Seele Spuren hinterlassen. Das Lesen dieser Spuren erschließt ein umfassendes Verständnis, was den Menschen ausmacht: Sozialverhalten, Bindungsverhalten, Moralfähigkeit, Lernen, Intellekt, Bewusstsein, Unterschiede zwischen dem Verhalten der Geschlechter, Aggression und Aggressionshemmung und politisches Urteilen und Wirken. In allen Bereichen des Menschlichen zeigt sich, wie eng Natur, Kultur und Geist verschränkt sind.
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• „Klare Beispiele ermöglichen dem Leser die Zusammenhänge zwischen Humanethologie, Psychologie und Philosophie besser zu verstehen." Barbara Antesberger (2012), *Mitteilungen aus dem Haus der Natur* 20: 106

• „Darwin nicht nur auf die Morphologie anzuwenden, sondern auch auf das Verhalten des Menschen und auf seine ‚höheren', seine geistigen Fähigkeiten und Leistungen – dazu bedurfte es weiterer Schritte, weiterer Einsichten, weiterer Kränkungen. Aber immer noch arbeiten die verschiedenen Forschungszweige für sich – was zwar bequem, aber nicht erfreulich ist." – „Mir gefällt an dem Buch, dass man auf jeder Seite etwas lernen kann – Grund genug, es zu empfehlen!" Gerhard Vollmer (2012), *Naturwissenschaftliche Rundschau* 7: 379

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Gerhard Medicus **Was uns Menschen verbindet**

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Was uns Menschen verbindet

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Psychology of Everyday Activity

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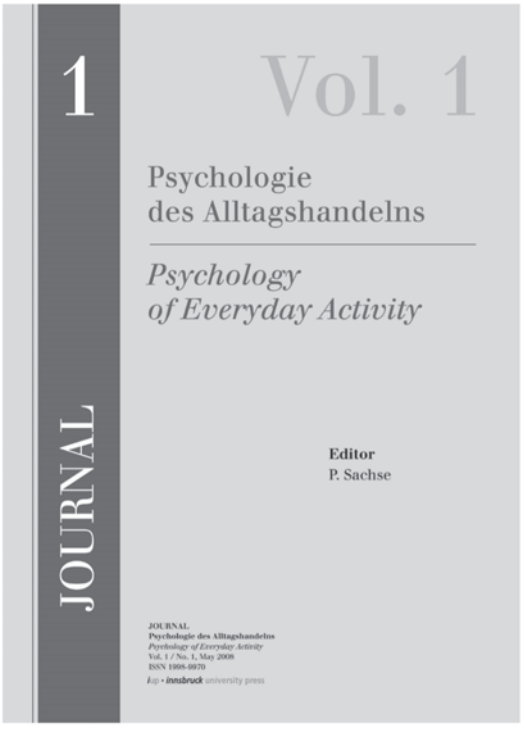

In der Psychologie hat eine Erkenntnis eine lange Tradition: Der *Alltag* ist jenes Terrain, in dem sich menschliches *Handeln* primär vollzieht. Dieses Handeln ist eine Form des Verhaltens; es ist all das, was wir tun, wenn wir arbeiten, uns betätigen, uns austauschen, miteinander umgehen usw. Diesem alltäglichen Handeln gilt es unter Berücksichtigung *kognitiver, emotionaler* und *motivationaler Prozesse* auf den Grund zu gehen. Eine fundierte Analyse des Alltagshandelns bedarf dabei der Einbeziehung fast aller psychischen Aktivitäten sowie der wesentlichen sozialen und materiellen Umgebungsbedingungen.

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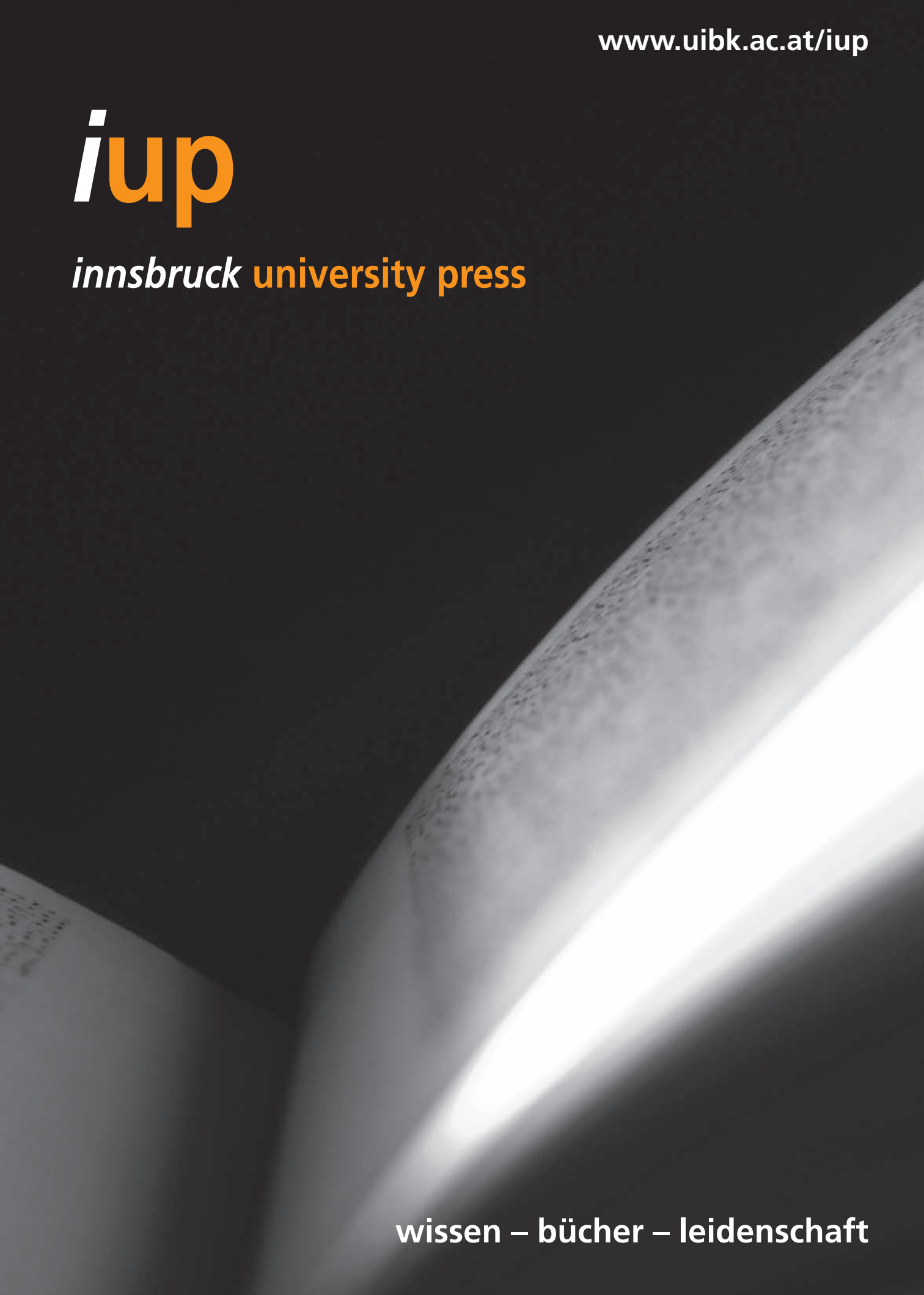

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