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RESEARCH ARTICLE

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The psychology of organizational and social sustainability

Abstract This paper presents 12 dimensions of work with the aim of providing further understanding of the relationship between work and the psychological well-being of workers. Previous research has indicated that these dimensions are significant in establishing such a relationship, which is essential to creating good work. These dimensions are also influential in their effect on the psychological state of workers and are translated specifically into actionable items in the workplace. A hypothetical system model is developed to relate these dimensions to one another, to workers, and to organizations. This set of dimensions also serves as a basis for further development of work design and evaluation tools.

Keywords work design, work dimensions, psychological factors, good work

1 Introduction and motivation

Work, especially in manufacturing systems, is an important pillar of the modern economy, which relies heavily on the production and consumption of manufactured goods. Over the course of history, the art of manufacturing in large quantities has been developed, implemented, and improved often by industrial engineers. Modern industrial engineers are responsible for designing, improving, and overseeing manufacturing systems, including the jobs and tasks that workers perform and the methods used to complete such jobs and tasks. Concepts, such as the assembly line, time, and motion studies, lean manufacturing, and six sigma, are commonly implemented in manufacturing to create high-quality products through efficient processes. The study and application of knowledge in health and safety, ergonomics, and biomechanics are also increasingly being integrated into the workplace to ensure the well-being of workers and the social sustainability of organizations.

Focusing on efficiency, throughput, and costs works well for many organizations. In addition to the efforts of industrial engineers, low-cost labor helps many industries reach such goals. Arguments have been made that the availability of goods at a relatively low cost has allowed for the modern quality of life that depends on material consumption. The use of low-cost labor and large-scale export of goods has enabled regions such as China's Taiwan, South Korea, China's Hong Kong, and Singapore (collectively referred to as the "Asian Tiger Economies") in developing successful economies. Such a focus has proven to be advantageous in the macro scale, but has certain hidden costs and dangers.

In 2010, many companies in China started reporting severe labor shortages. The report was surprising to many because in early 2009, 23 million migrant workers were laid off during the global financial crisis. China was also in the middle of a rise in its working-age population, which is estimated to be at 981 million. During the same year, over 14 suicide attempts were reported at Foxconn's Shenzhen complex, which manufactures for major brands such as Apple, Dell, and Toshiba, resulting in 12 deaths (Chan, 2010). Following Foxconn's troubles, several Honda assembly plants and their subsidiaries experienced large-scale labor strikes. To end these labor problems, workers in the affected companies were given 10%–30% raises (Chan, 2010).

Prior to such events, the working conditions in many Chinese companies were already under scrutiny. Long work hours, unfair contracts, poor working and living conditions, and other questionable labor practices were common (Ngai, 2005; Won, 2007; Wong et al., 2008). Following such incidents, many scholars and economists agree the availability of China's low-cost labor is coming to an end (Chan, 2010).

A decade later, the average wage in China has doubled further (Trading Economics, 2018). Companies in devel-

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oped cities that focused on the events a decade ago continue to experience labor shortages. The retention rate of young workers has been decreased because of various concerns in terms of wage, safety, and work-life balance (Ethical Trading Initiative, 2018). The Chinese government has passed laws and regulations to ensure that proper wages, benefits, working conditions, and other rights of workers are provided, all adding overhead costs to companies (Ngok, 2008; Chen, 2016). Companies have begun moving elsewhere in search of the next source of low-cost labor and strict regulations in which similar conditions are tolerated.

Such events suggest that although many manufacturing organizations have seemingly achieved high productivity and efficiency while providing their workers with relatively safe physical work environments, the psychological side of work has been largely ignored. Due to large-scale carelessness, the state of economies and societies can either be affected positively or negatively. The results are massive in scale and could affect societies, regions, and industries. Therefore, the present study aims to identify the factors of work critical to the formation of good work, which satisfies the physical, psychological, and social needs and positively promotes the health, quality of life, and social and cultural integrity of workers, stakeholders, and the broader society.

Several studies in domains such as psychology and business management are applicable in understanding psychological needs, which should be considered in the work design. This study reviews previous research to identify factors that can affect the psychological health of workers. This research also develops a set of work dimensions that can be applied to characterize and evaluate the psychological quality or goodness of work. In addition, the initial step in relating these factors to one another, workers and the large system for which they serve, is presented using a system dynamics causal loop diagram.

2 Literature review

In a work system, many factors can lead to good or bad psychological outcomes for workers. During the early stages of industrialization, the concern of work designers and managers focused primarily on issues such as productivity and later, physical safety. In modern times, such concerns are no longer adequate, as evident in the labor issues exemplified in China. These events highlight the importance of psychological considerations in the work design. The following sections indicate the harm that can be done to workers, organizations, and local societies when such considerations are not addressed. Theories that explain the causes of such harm are also presented.

2.1 Karoshi and Karojitsatsu

Worker suicide incidents in China were hardly the first time that work was found to cause death by means other than work-related accidents and injuries. During the 1970s, several work-related suicide incidents occurred across Japan, and the term “karojitsatsu” was coined to describe such incidents. The term literally translates to “suicide from overwork.” Many such incidents were correlated to stressful conditions, such as career changes (promotions or transfer), stressful work characteristics, long work hours, and low social support (Amagasa et al., 2005). In Japan, for example, a 2004 statistic reported that roughly 28% of non-agricultural employees worked over 49 h a week and 12% worked over 60 h per week, indicating overwork (Iwasaki et al., 2006). In relation to karojitsatsu, psychological stress and job strain resulting from similar work conditions (more of which will be described in the next section) can also lead to potentially deadly conditions, such as strokes, heart attacks, and other cardiovascular diseases (Karasek and Theorell, 1990; Uchiyama et al., 2005; Lo et al., 2007). As a result of work stress, karojitsatsu and death from physical illness fall under the general term “karoshi” or “death from overwork.” However, the term karoshi can also be used to refer to cases of permanent impairment due to overwork. Kanai (2009) identified job involvement, time commitment, work overload, role ambiguity, and role conflict as major contributing factors to karoshi. Measures implemented by the Japanese government to prevent karoshi include limitations on work hours, periodic medical examinations for workers, and professional guidance for overworked workers (Iwasaki et al., 2006; Asgari et al., 2016). However, statistics from Japan reveal the problem is still prevalent. In 2014, 121 recognized cases of karoshi were recorded in Japan, with 99 of them documented as karojitsatsu. Furthermore, 637 cases of brain- and heart-related diseases were recognized by Japan’s Ministry of Health, Labor and Welfare as caused by overwork (Asgari et al., 2016).

2.2 Demand-Control model

Many studies relating to karoshi revealed correlations between karoshi incidents and jobs characterized by high demand and low control over the work by the workers. This pattern points to the demand-control model suggested by Karasek and Theorell (1990), which is used to categorize work in terms of the magnitude of control and demand experienced by workers. Control refers to decision latitude and includes factors of work, such as discretion over the use of skills and the authority to make decisions concerning a task. Job demand includes various aspects of work, such as deadlines and production requirements, which impose requirements in terms of effort on the side of the workers.

The demand-control model characterizes work into four distinct types: high-strain, active, low-strain, and passive jobs. Jobs characterized as high demand and low control are referred to as high-strain jobs. An example is the

assembly line, where workers are required to perform specific and predetermined tasks while meeting rigid and stringent production goals. This type of work can lead to fatigue, anxiety, depression, and physical illness. Work characterized by high demand and high control is referred to as active jobs, such as those of surgeons and athletes. These jobs often carry high expectations, but workers are given authority and freedom to use their skills. These jobs also lead to active learning and their workers are the most active in leisure and social activities outside of work. In related research, Dollard et al. (2000) suggested that active jobs are associated positively with feelings of personal accomplishment. For certain (sometimes quite fortunate) people in society, their jobs are characterized by low demand and high control. These low-strain jobs include those of repairmen and architects. Jobs characterized by low demand and low control are referred to as passive jobs. Examples of such jobs include those of watchmen and an assembly line work, where instead of imposing high demand on workers, the workers are employed as machine-tenders. Passive jobs can lead to loss of learned skills, personality, and motivation (Karasek and Theorell, 1990; Wu, 2016). Karasek and Theorell (1990) and Karasek (2004) also suggested that the characteristics of work can be carried over to one's social life and have broad effects in society. Figure 1 summarizes the relationship among demand, control, and the resulting job.

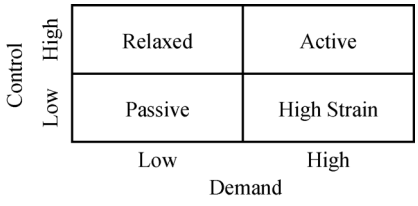

Fig. 1 Summary of Demand-Control model based on Karasek and Theorell (1990)

According to past studies, job strain creates a path for actions and conditions that can ultimately lead to serious cardiovascular diseases. In a study of the Japanese workforce, Nishitani and Sakakibara (2006) indicated that stress resulting from job strain can lead to unhealthy eating behaviors and obesity. Job strain is correlated positively to increased heart rate and blood pressure, smoking, and high serum cholesterol. In terms of physiologic responses, stressful work conditions can degrade people's cardiovascular health directly through catabolic responses, specifically the chronic elevation of catecholamine levels (Karasek and Theorell, 1990). Based on these findings, job demand and control are important risk factors in karoshi.

2.3 Demand-Control support model

Social interaction in the workplace in the form of helpful social interchange with colleagues and supervisors can also influence the psychological impact of work on workers. Social support can manifest as social integration and cohesion among members of an immediate organization, where mutual support presents itself as an extended interpersonal resource. The presence of social support can act as a buffer among work stressors resulting from high work demand, and in general, good long-term health (Karasek and Theorell, 1990). Social support in the workplace is associated negatively with the effects associated with job burnout, specifically emotional exhaustion and depersonalization, but is associated positively with job satisfaction (Dollard et al., 2000).

2.4 Motivation

Motivation is a broad domain of research to consider when investigating characteristics of work and how they can promote good work. Depending on the type of work provided for workers, work itself can be a source of motivation or a motivational sink among workers (Karasek and Theorell, 1990). Studies have also suggested that acts motivated by intrinsic motivation and self-determination can promote great performance and consume few mental resources.

2.4.1 Job diagnostic survey (JDS)

JDS is a methodology for assessing the motivational potential of a selected job by measuring the five job characteristics of work within the job (Harun and Karim, 2017). These job characteristics are skill variety, task identity, task significance, autonomy, and feedback. The first three job characteristics are related in that they are conducive to providing a sense of the meaningfulness of work. Skill variety refers to the degree to which a job requires workers to apply various skills and varieties of knowledge to accomplish a task. For example, maintenance employees responsible for the infrastructure of a company building are expected to use various skills compared to assembly line employees who place labels on products. Task identity refers to the "wholeness" of the work, referring to the degree to which the work produces a complete, identifiable product or result, from beginning to end. In this case, craftsmen who create products from raw materials can have more task identities than workers on the assembly line whose scope of work is limited to minute tasks. Task significance refers to the degree of impact of the work on others, inside and outside of an organization. Therefore, workers who tighten bolts on a commercial airplane production line can likely consider their task more

important than the workers who tighten bolts on cheap toys (Hackman and Oldham, 1980).

The two other job characteristics that contribute to work motivation are autonomy, which creates a sense of responsibility, and feedback, which provides workers with knowledge of their work results. Autonomy in work refers to the degree of freedom and independence given to workers to use their own discretion toward the aspects of work, such as scheduling and work procedures. Feedback from a job refers to the degree in which workers are provided with information regarding the effectiveness of their work performance.

JDS is a questionnaire-based survey that evaluates the magnitude of these five work characteristics based on the responses of workers to the questions. JDS also generates a Motivation Potential Score (MPS) for the work using the following equation (Hackman and Oldham, 1980):

$$\begin{aligned}\text{MPS} =&(\text{skill variety} + \text{task identity}\\ &+ \text{task significance})/3 + \text{autonomy}\\ &+ \text{feedback}.\end{aligned}$$

Apart from the five dimensions used to calculate MPS, the two supplemental job characteristics of JDS, namely, "feedback from agents" and "dealing with others," are not part of the equation to calculate MPS. JDS presents each job characteristic in the form of a statement and asks participants to rate it on a Likert scale from 1 to 7. The higher the MPS, the more motivation the job presents to its workers, and the less need for its workers to be motivated by external means.

The job generating the lowest MPS revealed by Hackman and Oldham (1980) was that of an overflow typing pool with an MPS of 7, with the highest being an autonomous organization development consultant with MPS of over 300. Hackman et al. (1978) observed that during a work reorganization event, workers whose jobs were enriched by these five work characteristics responded with high satisfaction and motivation. The opposite was true for workers whose jobs were de-enriched. Kopelman (1985) reviewed 30 organizations that implemented various work redesign measures. The author claimed that on average, companies that implemented work redesign measures observed increases in productivity, improvement in quality, and reduction in absenteeism.

2.4.2 The Learning Organization

Senge (1990) introduced the concept of the "Learning Organization" as an organization where "people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together." This type of organization is desirable for several reasons, including that it harnesses and promotes people's inherent motivation to learn. When members of an organization learn together as a team, the result becomes a capable and competitive organization. To create a Learning Organization, Senge (1990) identified five characteristics that must be developed in parallel:

1) Systems thinking: An organizational characteristic that views a business as a bounded system conditioned by inter-correlated actions that play out their effects over time.

2) Personal mastery: A characteristic where members of an organization continually develop their personal insights, skills, and commitment to learning.

3) Mental models: A characteristic where existing assumptions and preserved behaviors are continually challenged by learning.

4) Building shared vision: A characteristic where the leaders develop personal visions into organizational visions to motivate the organization.

5) Team learning: A characteristic where individual learning is accumulated into a collective form by lowering boundaries, sharing, and openness.

When these characteristics are developed together, a Learning Organization is created. The organization recognizes the intrinsic needs and wants of people to create intrinsically motivated, capable, and socially well-balanced individuals. This new type of organization and the collective capability it nurtures are also sources of competitive advantage in the modern market place.

2.4.3 Self-Determination theory (SDT)

Beyond JDS, which is developed specifically to study motivation in the workplace, other theories have been created to understand the general nature of human motivation (Ryan and Deci, 2017). SDT provides several important insights, the first of which points to three basic needs that contribute to enhancing human motivation: competence, relatedness, and autonomy. These needs are universally applicable among all human beings. Similar to the nutrients that sustain the physical body, these psychological needs are said to contribute to human psychological well-being. The need for competence refers to the effectiveness of people's interaction with a social environment, including work. The need for competence leads people to continually seek challenges. Relatedness refers to the sense of belonging, the feeling of care for, and being cared for by others. Moreover, autonomy refers to a feeling of self-direction. Similar to the natural tendency for humans to gravitate toward physical well-being, humans also gravitate toward situations that meet basic psychological needs. These three needs are considered important factors in maintaining and promoting motivation (Deci and Ryan, 2004).

Within SDT, motivation is characterized into different, continuous categories. Motivation is typically categorized as of intrinsic or extrinsic form. Intrinsic motivation describes motives of activities that are acted on due to

inherent reasons, such as finding the activities to be interesting, satisfying, or challenging. Thus, the behavior of individuals is said to be self-determined. A healthy child has a natural curiosity to explore its surrounding in the absence of any external reward. Thus, such actions can be regarded as being intrinsically motivated. Extrinsic motivation describes the motives for activities that are due to external reasons, which are not focused on but are still effective in driving such activities. SDT identifies four types of regulation styles that make up extrinsic motivation, which is characterized according to the level of autonomy that regulates the activities. These levels range from external regulation, which describes actions performed to satisfy external demands, such as rewards and fear of punishment, to integrated regulation, which leads to actions that satisfy values that are internalized for a person, the two in the middle being introjected and identified regulation. For example, a person threatened into performing labor has external regulation, whereas a person performing a task, which is congruent with his or her values, has integrated regulation.

Amotivation describes the situation where an activity is not motivated. Any behaviors are considered non-self-determined. Regulation is nonexistent in amotivation (Ryan and Deci, 2000; Deci and Ryan, 2004). This characterization of motivation into a continuum is useful in understanding the nature of motivation because such a characterization promotes an understanding of the effectiveness of motivation. Many life activities, often including those of work, are extrinsically motivated. To help internalize the motivation that drives such activities, SDT points to autonomy, competency, and relatedness as keys to internalize motivation.

2.4.4 Strength model/ego depletion

The parallelism between motivation and human physical characteristics goes beyond the similarities presented by SDT, where basic human psychological needs are compared to human physical needs (Tice et al., 2018). Researchers argue that mental processes draw on a common and limited resource: glucose. Research has indicated that glucose is the shared common resource the brain draws upon even when the mental processes are seemingly different. Once glucose is depleted, human behavior is affected.

Baumeister et al. (1998) revealed that mental processes, such as acts of self-restraint against temptations and decision making, lead to a decrease in persistence and performance for subsequent, unrelated tasks, illustrating the concept of depletion. In addition, depleted individuals subsequently behave passively (Baumeister et al., 1998). Inducing positive emotional states (Tice et al., 2007) and ingesting foods that contain glucose (Masicampo and Baumeister, 2008) are effective in restoring mental performance that has been previously exhausted. Depleted individuals also rely on small effortful mental processes, such as heuristics, whereas individuals whose glucose is replenished by sugared drinks can perform effortful reasoning in making decisions (Masicampo and Baumeister, 2008). Self-determination is also suggested to affect glucose depletion. Self-control exertion is not self-determined, that is, when the motivation to exert self-control originates from a low autonomous source, higher depletion occurs than if self-control exertion is motivated from an autonomous source (Muraven et al., 2007).

The research regarding ego depletion suggests that mental processes, many seemingly unrelated to each other, rely on glucose. Depending on various characteristics of a task, such as autonomy, intensity, and effort, a task may deplete the available glucose, leading to a lack of glucose for subsequent tasks. As a result, performing a day of unmotivating work can, in theory, leave workers depleted, leading to passivity, inability, and lack of persistence to perform other activities outside of work. This result can pose social issues when occurring on a large scale. Although focused on work itself, having mentally depleted workers can also adversely affect how they approach their work.

2.5 Burnout

Burnout from work is another condition that has been studied intensively for over the past 30 years. The condition of burnout is characterized by the psychological symptoms of exhaustion, depersonalization, and a feeling of lack in accomplishment and efficacy. Study findings suggest burnout is prevalent in jobs with high demand, characterized by work overload, personal conflict, and the lack of resources (control coping, social support, use of skills, autonomy, and decision involvement). Under these conditions, workers often show decreased organizational commitment, increase in turnover, absenteeism, and may even be led to physical illness. Tools have been developed to evaluate the amount of stress experienced by gauging the presence of burnout symptoms among workers. Studies have also led to efforts to improve jobs by addressing the symptoms of burnout within the workplace (Maslach and Goldberg, 1998). Fernet et al. (2004) claimed that job self-determination (motivation to perform a job by choice and pleasure) buffers workers from the negative effects of burnout due to job demand and control. In a study of social workers, Kim and Stoner (2008) suggested that autonomy and role stress are important factors in predicting burnout. Social support, autonomy, role stress, and burnout are also important factors to turnover intentions.

2.6 Other needs

The literature presented thus far reveals that the characteristics of work play key roles in determining long-term mental health and ultimately, the well-being of workers.

The literature also emphasizes the prevention of psychological harm resulting from work, and such prevention should be a prerequisite for good work. When these basic needs are met, other needs arise for psychological satisfaction. This tendency is well described in a well-known theory of human motivation, Maslow's Hierarchy of Needs. According to Maslow (1943, 1954), human needs are characterized into five levels. The low levels consist of physical, physiologic, safety, and social needs that focus on the necessities to survive, to feel comfortable, and to gain social acceptance. The high needs that arise after satisfying such low needs are those of esteem and self-realization, both of which involve satisfaction with regard to oneself and one's role.

Another consideration of work design influential to the well-being of workers is aesthetics. Aesthetics can refer to everything from the sights and sounds outside the window to the furniture within a workspace. In some cultures, this consideration has become systemized, such as fengshui in East Asian cultures and is regarded as an important factor of a workplace. Oldham et al. (1995) explored the relationship between factors of work performance and availability of background music through stereo headsets. Many prior studies have suggested a positive correlation between work performance and music, and the use of headsets allows workers to personalize their choice of music. The results indicated that workers who listen to music through stereo headsets exhibit an increase in job performance and satisfaction, with a decrease in turnover intentions (Oldham et al., 1995). Similarly, Leather et al. (1998) observed a relationship between the presence of windows and the emotional and psychological well-being of workers. The amount of sunlight penetration and view of the natural environment are correlated positively to job satisfaction and well-being but correlated negatively to turnover intention (Leather et al., 1998). The aesthetics of a workplace also depends on the objects within the workplace. Strati (1996) used an example of a chair to demonstrate the complexity of the relationship between the artifacts of an organization and the organization itself. Chairs are not only objects of utility but also landmarks in a workspace. A chair is not only a demonstration of the user position in an organization but also reflects the character of the designers, the organization, and its users (Strati, 1996). Schell et al. (2011) claimed that employees with psychologically demanding work, sleep disturbance, problems at work, and negative work stress express the high need for aesthetic improvements in their workspaces.

2.7 Summary

The concepts and theories presented in this section partially explain the relationship between the characteristics of work and the well-being of workers. Work design regulates worker motivation and health, and for companies, work design influences worker turnover, absenteeism, and work quality. Although each theory goes into great depth to establish these links, none of them can be used as a comprehensive guide to understand the psychological aspects of work. The factors presented by these theories must be organized, synthesized, and presented to non-experts who design work systems.

3 Determining dimensions of good work

Based on our summarized literature, we recommend that 12 factors should be considered when designing or evaluating work regarding its ability to provide psychological satisfaction and well-being. That is, deciding how good the work is. This section presents each dimension and its definition, then links it back to the literature that inspired the dimension in the first place. Although previous sections have mentioned few methods to evaluate specific dimensions, and additional ones will be mentioned in the next section, the scope of this paper focuses on identifying and defining the dimensions of good work, not on measuring these dimensions. For a discussion of this method, see Lee (2014).

3.1 Compensation

Compensation refers to all the material gains workers can obtain from a company by performing their assigned work. In today's world, compensation includes salaries, bonuses, retirement plan contributions, and other material goods that an organization gives to its workers in exchange for their work. Having reasonable compensation is considered a dimension of good work by establishing the link between compensation and a person's accessibility to the basic needs outlined by Maslow's Hierarchy (Kooij et al., 2014). The dimension is a practical matter and is often what business people and work designers turn to for labor solutions. During the labor unrests in China, pay often played an important role in motivating and resolving labor problems (Chan and Ngai, 2009). In a study focusing on the Chinese population, Wang et al. (2010) indicated that compensation is an important determinant of organizational commitments and worker turnover intentions.

3.2 Safety

Safety relates to the degree to which workers are protected from harm while performing their work and within the premises of the workplace. This dimension includes physical and physiologic aspects of safety.

Similar to the dimension of compensation, Maslow's Hierarchy plays an important role in motivating the dimension of safety (Maslow, 1943; 1954). Safety satisfies an inherent human need for preserving a state of good health. In many modern societies, government safety rules

and regulations are requirements for organizations to operate legally and their purpose is to protect citizens from injuries and illnesses. For example, in response to karoshi, the Japanese government has mandated medical examinations for workers to monitor their psychological and physiologic health (Iwasaki et al., 2006). Companies can also form their own safety programs that they enforce upon themselves and members of their supply chains. A good example is Apple's supplier code of conduct that provides specific expectations of its suppliers, including health education to boost awareness, preventative measures, access to services, and actively take responsibility of their own health. Similar programs were created for safety. In addition, they create opportunities for technical growth by setting up vocational programs to help employees climb up the ladder and making opportunities for higher education (Apple Inc, 2018). In certain cases, employees demand safety improvements in the workplace. In a study of a German company in China, Chan and Ngai (2009) argued that its workers' demand for clean drinking water at the workplace is one of the terms to settle a strike.

3.3 Social interaction

Social interaction refers to the degree to which workers interact with each other while performing their work. This dimension includes talking, taking breaks together, and simply working together.

Social support is an important factor in improving the emotional health of workers. Karasek and Theorell (1990) defined social support as an "overall level of helpful social interaction available on the job from co-workers and supervisors." Social support can be measured in three levels: degree of social and emotional integration and trust, social cohesion and integration, and extra assistance with work tasks from coworkers and supervisors. To gain social support, the right conditions in the workplace must be implemented, the basis of which is interaction. The amount and quality of social interaction is a controllable factor of work, which can lead to social support (Bakker and Demerouti, 2017). As highlighted in the literature review, the lack of social support is a contributing factor to karoshi (Amagasa et al., 2005; Meek, 2004) and burnout (Maslach and Jackson, 1981; Maslach and Goldberg, 1998). The lack of social support is also reflected by the need for relatedness in SDT, the supplemental job characteristic of "dealing with others" in the JDS, and team learning in a Learning Organization.

3.4 Variety

Variety refers to the number of different types of tasks workers perform in the workplace. This dimension includes working on different products, performing different tasks, working at different workstations, and other variations (Yoo et al., 2018).

This dimension also comes from the factor of skill variety presented by Hackman and Oldham (1980), who identified it as "the degree to which a job requires a variety of different activities in carrying out the work, involving the use of a number of different skills and talents of a person." Its implication for the workplace and work design is clear: avoid monotonous work. When taken to an extent where various tasks result in a complete, identifiable product and result, the job characteristic of task identity is also used in calculating MPS. Skill variety and task identity are identified as factors contributing to the meaningfulness of work (Hackman and Oldham, 1980).

3.5 Aesthetics

Aesthetics refers to the exposure of workers to beauty and creativity as part of performing their work. Beauty can come from the physical features of the workplace, such as its orderliness, cleanliness, or the presence of suitable work surfaces and seats, to the quality of light and sound in the work environment. The work object itself can also serve as a source of beauty and an opportunity for creativity (Witz et al., 2017).

The study of aesthetics in the workplace is hardly new. For example, East Asian cultures have feng shui, which may be appropriated to the workplace. The lean manufacturing concept of 5S (sort, straighten, shine, standardize, and sustain) has been applied to keep the workplace clean, orderly, and efficient. Konz and Johnson (2008) provided aesthetics-related considerations for office designs, including considerations for furniture selection, cubicle arrangement, color, and spacing. The literature review reveals that aspects of the workplace such as sound, sight, and lighting can affect levels of work satisfaction and stress. Maslow (1954) also observed a basic aesthetic need for individuals who crave beauty and can even get sick in special ways from ugliness.

3.6 Feedback

Feedback refers to the amount and quality of information workers receive regarding their work performance.

Hackman and Oldham (1980) defined job feedback as "the degree to which carrying out the work activities required by the job provides the individual with direct and clear information about the effectiveness of his or her performance." Hackman and Oldham (1980) also stressed the importance of having feedback from performing the job itself and directly from the users, similar to the concept of intrinsic feedback in human factors engineering. Another form of feedback presented by Hackman and Oldham (1980) is "feedback from agents," which comes from coworkers, supervisors, and managers. This form can also be perceived as extrinsic feedback in human factors. JDS measures both types of feedback (Hackman and Oldham, 1980).

3.7 Accomplishment and status

The dimension of accomplishment and status relates to the subjective feeling of satisfaction toward one's attainment in one's work. Note that satisfaction has two seemingly different aspects. Accomplishment focuses on one's internal feelings toward the specific attainments, whereas status focuses on the external standing of one's position as a result of the attainments, that is, the esteem of others (Tarcan et al., 2017).

In describing esteem needs, Maslow (1954) stated that "[esteem] needs may therefore be classified into two subsidiary sets. These are, first, the desire for strength, for achievement, for adequacy, for mastery and competence, for confidence… second… for reputation or prestige… status, dominance, recognition, attention, importance, or appreciation" (Maslow, 1954). Similarly, this dimension focuses on the degree to which work provides a sense of achievement, reputation, and prestige. This type of satisfaction also has two sources. First is the internal sense of pride that results from good performance. Second is the external status of a person in terms of social status and recognition. Different cultures may place different weights upon the importance of the two sources of satisfaction, as highlighted by the concept of "face" prevalent in Asian cultures (Bjerke, 1999; Keegan and Green, 2005) that leads to a high preference on the external over the internal.

3.8 Demand

Demand refers to the physical and psychological effort, which is applicable in many current workplaces. Workers must have both efforts to accomplish their work, given the available resources, such as time. In human factors engineering, demand can be described as mental workload, but with a time scale of hundreds or thousands of days.

Karasek and Theorell (1990) explained that demand reflects "how hard you work." Task-based aspects of demand that can be considered in evaluating the magnitude of demand include production target and time requirement. The conceptualization of psychological work demand can be difficult because of its many sources, such as the level of skill, fear (of losing the job for example), and interpersonal conflicts. In Karasek's Job Content Questionnaire, psychological demands and mental workload are measured in terms of four aspects: general psychological demands, role ambiguity, concentration, and mental work disruption (Karasek et al., 1998).

Other methods can also assess the mental workload imposed by work tasks. For example, Reid and Nygren (1988) presented the Subjective Workload Assessment Technique that focuses on three aspects: time, mental effort, and psychological stress loads. Hart and Staveland (1988) described the NASA-TLX method that considers mental demand, physical demand, temporal demand, performance, effort, and frustration level. These methods are usually applied to short timescale, task-level analyses.

Based on studies on ego depletion, psychological work demand may be correlated positively to the amount of mental resources required to sustain the effort. Although the magnitude of demand is correlated positively to stress, low work demand also poses boredom and fatigue (Finkelman, 1994) and opens the door for overly passive jobs.

3.9 Autonomy

Autonomy describes the degree of control workers can exert over their work. The more control they have, the more they can freely apply their knowledge, skills, and creativity toward performing work and deciding how and when to perform their work (Llopis and Foss, 2016).

Autonomy is presented as a core job characteristic of the MPS equation, defined 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" (Hackman and Oldham). Autonomy contributes to motivation by creating the psychological state of having responsibility for the outcome of work (Hackman and Oldham, 1980). Autonomy is also recognized in SDT to have a positive correlation with motivation internalization (Ryan and Deci, 2000). In addition, autonomy is related closely to the dimension of control in the demand-control model. However, the definition of control in the model includes decision authority and skill discretion, with skill discretion considering the skills workers possess (Karasek and Theorell, 1990). This definition of autonomy does not cover the issue of variety, which is treated as a separate dimension (see above).

3.10 Value

Value describes the importance of one's role and its impact within and beyond organizations. Workers can feel their work is valuable for many reasons, such as having an important role in an organization, being part of an important organization, or producing products that are well regarded by society.

This definition is best reflected by the job characteristic of task significance presented in Hackman and Oldham (1980), defined as "the degree to which the job has a substantial impact on the lives of other people, whether those people are in the immediate organization or in the world at large." Holding a job with high value can lead to the satisfaction of human need for self-esteem, as suggested by Maslow (1954), through developing self-respect and enjoying respect from others. This idea is applied to an organization through a shared vision in a Learning Organization, where the organization vision can provide strong motivation for people within the organiza-

tion by knowing not only that are they in control of their own future but also what they stand for matters (Senge, 1990).

3.11 Technical growth

Technical growth refers to opportunities available to workers for them to be exposed to and obtain work-related skills and knowledge that can be applied to perform their work well and further their professional careers.

The need for growth here is related to the psychological need of competence in SDT, which is defined as "feeling effective in one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capacities" (Deci and Ryan, 2004). Technical growth should be perceived as a prerequisite to competence. In the work environment, technical skills are necessary prior to effectively exercising one's capabilities. Such skills are the backbone for Senge's (1990) concept of personal mastery in a Learning Organization, where people are continuously educated to be skilled at their work and beyond. Hackman and Oldham (1980) pointed out that even for jobs with great motivation potential, dissatisfaction can still result from performing the job poorly due to having low job-related knowledge and skills. From a broad perspective, opportunities for technical and personal growth can also satisfy the human needs of curiosity, to know, to explain, and to understand, as observed by Maslow (1954).

3.12 Personal growth

Personal growth relates to the degree to which the work helps its workers further themselves according to their personal values. On the low end of this continuum, work may be detrimental if it requires its workers to perform tasks that go against their values (Dwivedula et al., 2016).

At the top of Maslow's Hierarchy of Needs are the needs for self-actualization. Maslow (1954) indicated that unless individuals do what they are fitted for, new discontent and restlessness can soon develop. This need is satisfied through becoming everything that one can become, although the specifics of which can vary across people. However, Hofstede et al. (2005) suggested that although individuals have different personalities within populations, they share certain values and preferences on the basis of cultural characteristics. Thus, in terms of work design, growth direction can be defined by understanding the values of worker populations. Schumacher (1979) pointed out that good work is work that develops workers.

3.13 Summary of dimensions

Table 1 summarizes the work dimensions by providing a condensed definition and a list of the main sources of inspiration for the dimensions.

4 Dynamics of work dimensions

These dimensions have far-reaching implications. In this section, we present general examples of relationships between organizational and social factors through documented case, followed by a hypothetical model.

4.1 Social and organizational importance of work

Many existing studies point to a correlative relationship between the nature of work and several aspects of social sustainability. Our study focuses on possible causal relationship between work and quality of life, in the personal and social realm.

Karasek (2004) discussed the spillover effect, a concept suggesting that emotional characteristics of work can be carried over to other parts of life. For example, working in a passive work environment (one with low control and low demand) can lead to one living a passive leisure and political life off work. Other studies also reveal that those with and suffer from work characterized by frequent overtime, low autonomy, and lack of social support have limited leisure and family life and personal problems, such as elevated blood pressure, cardiovascular disease, distress, sleep disturbance, and deaths from related illnesses (Rau and Triemer, 2004; Uchiyama et al., 2005; Iwasaki et al., 2006; Lo et al., 2007; Illes et al., 2010). Such stresses have also been linked to behavioral issues, such as poor eating habits and obesity (Nishitani and Sakakibara, 2006), alienation, anxiety, burnout, depression, dissatisfaction with work and life, fatigue, and hostility (Kahn and Byosiere, 1992). In extreme cases, these stress-inducing work conditions have led to suicide incidents (Amagasa et al., 2005), which are precursors to the Chinese labor riots and the severe labor shortages that follow (Chan, 2010).

The consequences of a stressful, poor work environment pervade beyond the personal realm. The effects of poorly applied work lead to crippling labor problems. For example, within the major automakers across the world, including Volvo in the 1960s to Toyota in the 1990s, many were forced to turn away from traditional and demanding forms of work and explore alternative work systems due to serious issues, such as employee turnover, absenteeism, and recruitment difficulties. The solutions included efforts in redesigning work to be psychologically appealing and employing automated systems to be less dependent on labor (Sandberg, 1994; Moezzi, 1998; Pil and Fujimoto, 2007). Furthermore, such stress leads to the reduction in work performance, increase in accidents and errors as well as in drug and alcohol use (Kahn and Byosiere, 1992). These labor and organizational issues may prove costly for work organizations. Instead of embarking on costly and seemingly uncertain efforts to rectify labor problems, organizations can resort to outsourcing or even moving operations elsewhere in the world — threatening the economic underpinning of societies.

Table 1 12 Dimensions of Good Work

Dimension	Definition	Main Sources of Inspiration
Compensation	All material gains workers can obtain by performing their assigned work	Maslow (1943;1954), Chan and Ngai (2009)
Safety	Degree to which workers are protected from physical and psychological harm while performing their work and within the premises of the workplace	Maslow (1943;1954)
Social Interaction	Degree to which workers interact with each other during work	Karasek and Theorell (1990), Deci and Ryan (2004), Ryan and Deci (2000), Hackman and Oldham (1980), Maslach and Goldberg (1998)
Variety	Variety of tasks workers perform in the workplace	Hackman and Oldham (1980)
Aesthetics	Exposure to beauty and creativity while performing work, possibly from the workplace, the work environment, or the workplace itself	Maslow (1943, 1954)
Feedback	Amount and quality of knowledge workers receive regarding their work performance	Hackman and Oldham (1980)
Accomplishment and Status	Feeling of satisfaction toward one's attainments at work and one's place within an organization	Maslow (1943, 1954), Keegan and Green (2005)
Demand	Physical and psychological efforts required from workers to accomplish the task	Karasek and Theorell (1990), Maslach and Goldberg (1998)
Autonomy	Degree of control workers can exert over their work in terms of freely applying their knowledge, judgment, skills, and creativity	Hackman and Oldham (1980), Karasek and Theorell (1990), Maslach and Goldberg (1998), Maiscampo and Baumeister (2008)
Value	Importance of one's role and its impact within and beyond an organization	Maslow (1954), Hackmen and Oldham (1980), Senge (1990)
Technical Growth	Opportunities available to workers to obtain work-related skills and knowledge that can be applied to their work and career	Maslow (1954), Hackman and Oldham (1980), Senge (1990), Deci and Ryan (2004)
Personal Growth	Degree to which work helps its workers further themselves according to their personal beliefs and values	Maslow (1954), Hofstede and Hofstede (2005), Schumacher (1979)

These psychological and organizational issues can easily propagate to the social realm. As previously pointed out, the consequences of the spillover effect can threaten important social functions, such as political participation (Karasek, 2004). Cotter and Song (2009) suggested that families with adults holding full-time jobs are less involved in religious participation than families with other arrangements. Putnam (2000) presented a broad array of negative trends among several political, civic, and social involvements. He summarized these concerns in terms of degrading social capital, the often intangible benefits derived from a collective society. Putnam (2000) also attributed this harmful trend to various causes such as generational change, technology and mass media, and work.

The presented relationships and the hypothetical model require validation with real-world data. However, we expect that managers can understand the dynamics of work

characteristics, work factors, and psychological factors through this model. Such dynamics can guide their decision making in designing good work.

4.2 Hypothetical model and relationships

This section illustrates the relationships among the 12 dimensions, general psychological implications, and overall manufacturing health system using a causal loop diagram (Fig. 2). The factors in the diagram can be divided into three categories. Work-dimensional factors are composed of the 12 dimensions of work presented in prior sections of this paper. Work factors include motivation, psychological fatigue, physical fatigue, and physical capability, whereas organizational factors include production cost, cycle time, quality, and productivity. Social quality of life (QOL), which does not formally belong to any of the previously mentioned systems, serves as a general pathway to the social system.

Within the figure, work dimensions are shown in italics, whereas organizational factors are in bold text. Bold arrows indicate strong relationships between two factors, whereas dashed lines identify loose relationships often dependent upon work scenarios. This hypothetical model, which uses Sterman system dynamics modeling standard notation (Sterman, 2000), describes basic behaviors related to work characteristics and organizational factors within a production organization. The system dynamics model is established to illustrate typical relationships among the 12 dimensions. These relationships are collected from multiple literature, which has conducted empirical studies to examine the impacts of the factors (Zhang et al., 2013a; Zhang et al., 2013b, 2015a; Zhang et al., 2015b). In this study, the relationships in the hypothetical model are literature-based assumptions. Further research must be conducted to confine the relationships among factors and their accuracy.

Relationship between Psychological Factors and Work Dimensions: Motivation is a key factor that permeates all dimensions. Motivation also validates its importance and serves as the driving force in work and life (Vroom, 1982). For example, having the right form of demand (i.e., given autonomy and social interaction) can be an important motivator for workers based on Karasek's demand-control-support model (Karasek and Theorell, 1990). However, under other conditions, demand alone can deprive workers of motivation, leading to psychological fatigue and ultimately, burnout. The opposite but codependent relationship between motivation and psychological fatigue serves as a pathway between work design (characterized by the 12 dimensions) and psychological impact (motivation and psychological fatigue).

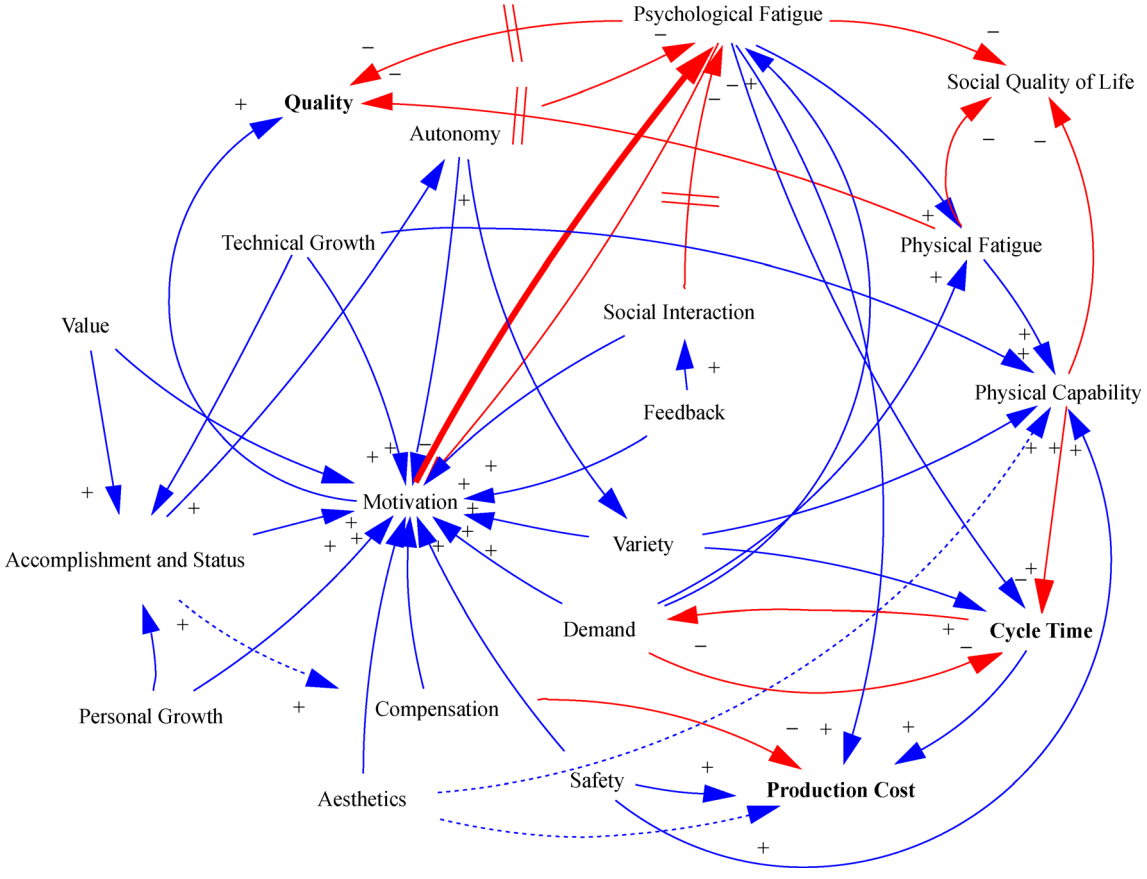

Fig. 2 Feedback relationships among psychological factors, work factors, and work dimensions

Relationship between Organizational Factors and Work Dimensions: Time, cost, and quality are selected to represent organizational factors due to their role as traditional performance metrics for project management and production (Bethke, 2003). Work system performances are commonly measured using this project management triangle (time-cost-quality), through which work characteristics and psychological factors can affect production organizations.

As demonstrated in our model, demanding work likely creates short cycle times. The inverse is also true, work with short cycle times leads to increase in work demand by loading on additional work within a given period. Among the 12 dimensions, safety and aesthetics can affect production cost. Safety-related maintenance often requires a certain degree of investment, such as through the application of 5S, to improve the work environment and condition. However, the effectiveness of 5S depends on various factors and scenarios, thus implying the loose relationship among aesthetics, physical capability, and production cost. Compensation and labor cost have a strong and evident connection. Organizations often resort to increasing compensation to address means of motivation. However, previous cases often indicate that such means are temporary, and the root cause lies in improving the psychology of work itself.

Relationship within the 12 Work Dimensions: Direct relationships exist among the 12 work dimensions. For example, the increase in personal growth, value, and technical growth is essential for creating work that delivers a high sense of accomplishment and status. Furthermore, high status and accomplishment often result in increased compensation (not always the case, however) and high autonomy in work. Consequently, high autonomy usually allows workers to do various tasks. In addition, the extrinsic form of feedback can lead to increased social interactions among workers.

This model can be used at multiple levels in an organization. Engineers can use the relationships to assist shop floor work design, such as workcell layout, operation improvement, and safety enhancement. At the organization level, this model can assist managers in making tactic and strategic decisions on work policy and corporate social responsibility development. The model can also be employed to assist researchers in developing empirical studies on organizational work design improvement.

5 Discussion and future work

Several points should be discussed and clarified regarding these 12 dimensions of work, including their limitations, the relationship among dimensions, and how they affect workers. The overall significance of this research, that is, the search for good work, is also an important consideration. As indicated in previous studies, poorly conceived work often leads to problems such as karoshi and burnout of workers, employee turnover, unreliable employees, and even passive existence as opposed to active participation in society. The 12 dimensions of work serve as a starting point for further research to tackle these issues in the industrial society.

However, the 12 dimensions of work presented in the current study are likely incomplete. They are identified through our literature review that focuses on identifying the psychological factors of work that satisfy three criteria. First, the dimensions must be applicable to the manufacturing workplace. Second, the dimensions must be subject to evaluation and manipulation through the work design by industrial engineers and managers. Third, the dimensions must satisfy worker needs and wants. With further research, other relevant dimensions can be included in addition to the 12 listed here. However, for the purpose of the current research, this set of dimensions serves as a satisfactory starting point for us to develop a work design instrument to characterize and design good work.

The complete nature of these 12 dimensions is also unclear. Should they be maximized? Should only some of them be maximized and others not? Our current hypothesis is — it depends. Various studies, such as those of Goldmann (1976), Mole (1990), Bjerke (1999) and Hofstede et al. (2005) that have considered different workplaces across cultures, suggest that the preferred type of workplace can differ according to the cultural background of the worker population. Although certain studies indicate that a dimension should be maximized to achieve the desired motivation and satisfaction for people in general, determining how factors such as culture, economic status, and industry interact to yield preferences in each dimension is interesting.

As discussed in Section 4, many dimensions are correlated or dependent on one another in terms of work. For example, in the workplace, compensation can often reflect one's status and accomplishments within an organization, the value of one's role, and even the demand placed upon a worker. Before granting autonomy to workers, they must receive enough technical skills and knowledge to effectively work while being autonomous. This study demonstrates these possible relationships by employing our hypothetical model. However, testing the accuracy of this model is beyond the scope of this paper. Nevertheless, doing so is also a logical next step for this research, given the demonstrated broad scope of impact these dimensions possess toward organizational and social well-being.

Therefore, the 12 dimensions of work have become the basis of further research. In studying the role of cultural differences on the types of work that can be considered good, the dimensions can be employed as factors to describe and characterize such work.

By employing the 12 work dimensions, Lee (2014) designed a mixed-method survey and used it to study the

electronics workers in Eastern China and North-west United States. The results indicate that differences (and similarities) exist between the preferences of the two populations. The findings suggest that US workers consider demand, variety, technical growth, and autonomy as more important considerations than those of their Chinese counterpart while seeking high demand, variety, technical growth, accomplishment and status, value, and compensation. The same study has also compared local and migrant workers in China, identifying compensation as the most evident difference between local and migrant workers. Therefore, these dimensions must not be considered equivalent among populations of different backgrounds. Certain dimensions are considered more important and conducive to psychological satisfaction than others, varying from population to population.

Gini (2000) highlighted various sources in search for the defining factors of good/bad work. Most sources he came across refer to factors similar to the dimensions presented in this paper. Some of his sources also indicate that good, meaningful, or satisfying work has "enough" certain aspects of work and has "goodness of fit" between workers and work. In addition, companies such as Volvo (Sandberg, 1994) and Semco (Semler, 1989, 2007) have already set examples on ways to create good work. With previous efforts of pursuing good work as a source of inspiration, the 12 dimensions of work and the employed survey have also been developed into a systematic work design methodology to fit work to their workers (Lee, 2014). We expect the 12 dimensions of work will continue to inspire research and industry efforts to bring good work into reality.

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