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Contextualizing Human Skills Education for Legacy Countries: The Educators' Perspective

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This paper explores the focus and management of education contextualized for a legacy-archetyped country in the condition of industry 4.0. This paper also offers a doable framework for a contextualized human skills education (CHSE). This research is exploratory and uses secondary research, open-ended surveys and interviews, and round table and focused group discussions with participating education managers, technology managers, and technical and engineering professors from private and government higher education institutions in the Philippines. The majority of the participants agreed that for a legacy country, like the Philippines, where human capital is an important production driver, education must focus on human skills or soft skills. The participants maintained that critical thinking, complex problem solving, creativity and cognitive flexibility are the topmost important skills needed to thrive in the fourth industrial revolution. People-oriented skills like coordinating with others, judgment and decision making, service orientation, and negotiation are also recognized as vital technologies directly affecting human beings and the environment. There is a dearth of studies on education and educational management contextualized to a country archetype. Thus, this study is novel, relevant, and contributes to advancing knowledge in this particular field.

Key words: *Contextualized education, Critical thinking, Human skills education, Industry 4.0, Legacy country, Soft skills.*

Introduction

Industry 4.0, or the Fourth Industrial Revolution (FIRe), is characterized by a fusion of technologies, blurring the lines between the physical, digital, and biological spheres (Schwab, 2016). This industrial revolution is distinctively evolving at an exponential, rather than a linear, pace, bringing a transformational disruption to almost every industry (www.avvanz.com, 2017). Artificial intelligence (AI), robotics, Internet of Things (IOT), nanotechnology, neurotechnology, biotechnology, cloud technology, data analytics, blockchain, and 3D printing, have steered industry 4.0. This era opens new opportunities and perspectives for the development of production and education. Industry 4.0 brings out dramatic changes that demand rethinking of the ecosystem of value creation in human capital, redirecting the management of technology and education and redefining its legal regulations, especially for developing economies.

Previous studies on the impact of industry 4.0 lay down several possibilities, wherein some pose manageable threats to the education sector. One of these possibilities is the vanishing relevance and utility of today's education with the approximation that 65 per cent of children entering primary school will find themselves in occupations that today do not exist (World Economic Forum, 2016), thus presenting a threat to 40 per cent of jobs both presently and in the future (Janikova andKowalikova, 2018).

Other commonly reported possibilities are the substitution of humans with machines, such as the use of AI that replicates human behavior. The expansion of AIs' skills is likely to depress the wages of industrial workers (DeCanio, 2016), for the automation of services lessens the use of human services (Shahroom andHussin, 2018). Certain highly-skilled workers will succeed wildly in this new environment [industry 4.0], but far more workers may be displaced into lower paying service industry jobs, if not into permanent unemployment (Smith and Anderson, 2014). In the Philippines, for instance, 49 per cent of wage workers face a high probability of being affected by automation, and around 89 per cent of salaried workers in the business process outsourcing (BPO) sector fall into the high-risk category of automation (International Labor Organization, 2016; Albert and Serafica, 2018).

These two alarming scenarios may be approached with varying degrees of practicality and urgency by countries with distinctive archetypes such as leading (complex structure of production and favorable drivers of production), high potential (simple structure of production and favorable drivers of production), legacy (complex structure of production and unfavorable drivers of production), and nascent (simple structure of production and unfavorable drivers of production) (Lugtu, 2019).

The Philippines, along with Hungary, India, Lithuania, Mexico, Romania, Russian Federation, Slovak Republic, Thailand, and Turkey, is archetyped as a legacy country, or a country with a strong production base, at risk in the future due to weaker performance across drivers of production, which include technology and innovation, human capital, global trade and investment, institutional framework, sustainable resources, and environmental demand (World Economic Forum, 2018; Albert and Serafica, 2018). Per the WEF Readiness for the Future of Production Report 2018, legacy countries need to avoid getting squeezed between more advanced leading countries, that often offer more advanced manufacturing, and nascent countries that often offer lower cost labour. This starts with improving the institutional framework, investing in human capital, and boosting technology platforms and innovation capacity — the three areas in which legacy countries, on average, perform the worst.

The citizens of legacy countries must be proactive enough to address the gaps and challenges they face. Paying particular attention to human capital investment, this situation calls for education and technology managers to innovate and contextualize education and training so that it remains relevant, timeless, and empowering, hence making machines and humans complements and not substitutes. Thus, this paper explores the focus of education and its management contextualized for a legacy country in the conditions of industry 4.0.

Methods

Research questions, design and participants

The issues of management and the legal regulation of innovation, modernization, and contextualization of education in the condition of industry 4.0 are inadequately studied. Instead, most reports focus on macro issues regarding readiness and preparations, and the challenges, opportunities, and drivers of FIRe. Because of the scarcity of prior studies, it is ideal that exploratory research is used. This study moves away from extensive statistics and focuses on the real experiences and the smart, well-grounded viewpoints of participants directly involved in education. There are 130 purposively sampled participants including education managers, technology managers, and technical and engineering professors from private and government higher education institutions (HEIs) in the Philippines. The average participants' age is 35.9 years. They have an average of 11.2 years of academic engagement and an average of 5.4 years of industry experience. This study uses open-ended surveys and interviews, secondary research, and round table and focused group discussions with select participants. Specifically, the study answers the following questions:

1) Between technical skills (hard skills) and human skills (soft skills), which must be the focus of education in the context of industry 4.0?;
2) What skills are particularly needed by a legacy or developing country like the Philippines to thrive in FIRe?;
3) How can skills education be contextualized and managed effectively?

Using the top skill set identified by the World Economic Forum (WEF) as a benchmark, the participants were asked to give their own skills prioritization in the context of learners' needs, importance, and applicability to industry based on their experiences. The participants identified additional skills not on the list but still considered to be contextual and urgent. The procedure was similar to how the skill set 2020 was first conceived. In that inception process, the topmost human resources and strategy officers from leading global employers were asked to select from a list of skills and rank them in order of importance to the current and future working landscape (https://rmresults.com, 2017). Moreover, the participants of this present study recommended approaches to learning of and working with each emerging technology identified by the WEF in 2018.

Through round table and focused group discussions, the participants proposed management approaches in the context of education and technology capabilities of the Philippines as a legacy country. The data analysis employs the thematic analysis method (Braun and Clarke, 2016). This method assists in determining patterns from the collected answers to fulfill the study's objectives.

Results and Discussion

The consensus: human-skills-focused education

A majority of the participants agreed that for a legacy country like the Philippines, in which human capital is an important production driver, education must focus on **human skills** (commonly called soft skills). The participants settled for a kind of education where the reskilling and upskilling of students and employees is the primary concern. This is based on the following contentions: 1) technologies are fast-paced and technical or digital skills often become outdated; 2) hard skills are temporary while soft skills are permanent and more human; and 3) the country is largely dependent on human capital.

Fast-paced technologies, outdated technical skills

The participants contended that people in most developing countries are technology users more often than they are technology creators. This takes support from previous reports that the diffusion of technology in developing countries like the Philippines depends on both access to and absorption of foreign technology (World Bank, 2008; Lebesmuehlbacher, 2015). The participants argued that users of technology do not have control over the unprecedented evolution of a particular technology. Consequently, focusing education on technical [hard] skills would be glaringly impractical because technology changes in short spans of time.

Temporary hard skills, permanent soft skills

Relative to the first argument, the participants maintained that human skills or soft skills must be given significant attention in education. Balcar (2016) strengthened this argument by stating that increasing awareness of the productive potential of soft skills has sparked a discussion of their systematic and purposeful development, despite the fact that education systems in most countries pay limited attention to this topic and remain focused on the development of hard skills.

Soft skills separate humans from machines; they are permanent skills (Jarche, 2018). Soft skills are more personality-focused, rather than being based on qualifications or work experience. Soft skills include people skills, social skills, character traits, interpersonal skills, and transferable skills. Hard skills, on the other hand, are technical skills (McNamee, 2018). Technical skills and knowledge will be of a lower importance as machines learn to carry out technical tasks and as artificial intelligence allows for knowledge to be shared globally (Deloitte, 2016). Technological and societal disruptions are coming at us thick and fast. A focus on skills and human capital gives a strong foundation from which to build a sustainable and inclusive economy (Skills Development Scotland, 2018).

Human capital development

The first and the second participants' contentions still interlink with the third. For developing economies which generate revenues from overseas workers' remittances, escalating human skills is equally important. In particular, supporting the second contention is the claim that investment in human capital is still the best protection against skill obsolescence (Dadios*et al*, 2018). This contention takes strong foundations from human capital theory, resting on the assumption that education is highly instrumental and necessary to improve a population's productive capacity. Human capital theory emphasizes how education increases the productivity and efficiency of workers. This theory stresses the significance of education and training to participation in the new global economy (Almendarez, 2011). As a legacy country, the Philippines and its counterparts must be strategic in terms of human capital development. Otherwise, its economy will endure the "squeezing effect" caused by leading and nascent countries. For instance, the Philippines may be squeezed between Singapore, which often offers more advanced manufacturing, and Indonesia, which often offers lower costing labour. The Philippines risks being unprepared to capture advanced manufacturing share in the near future by not investing in the drivers of future production (Lugtu, 2019).

Human skills will become more critical in the future, so employees will need to shift their focus to the things machines cannot do such as reading people's emotions and reacting accordingly, or thinking creatively. Robots and AIs may help people accomplish tasks faster,

but they cannot be as creative as humans. Machines are becoming smarter, and so people need to use diverse human skills to work side by side with them (www.aigroup.com.au, 2019).

Having established that human skills (soft skills) must be the focus of education, does this mean that the technical or digital skills (hard skills) should be completely neglected? The participants contended that while a focus on soft skills is becoming increasingly widespread, hard skills should not be completely discarded. Hence, teaching the "**fundamentals**" of technical or digital skills is still significant. With a fundamental knowledge of machines and technologies, a person will never lose track of the digital sphere. Augmenting the hard skills largely depends on one's possession of human skills such as critical thinking, creativity, flexibility, and adaptability.

Skills prioritization

Industry 4.0 will transform the way we live and work. Some jobs today will totally vanish and be replaced by new ones. One thing is certain – the future workforce will need to adjust its skillsets to keep pace (Gray, 2016). This means that the required skillset will change in most industries. (Ying, 2017). Contextualizing skillsets for a particular country archetype will become more relevant. Table 1 shows the participants' ranked skillsets in comparison to the WEF skillsets of 2020.

Table 1: Participants Re-ranking of Skills 2020

Skills 2020 (WEF)		**Participants Ranking**
Complex problem solving	1	Critical thinking
Critical thinking	2	Complex problem solving
Creativity	3	Creativity
People management	4	People management
Coordinating with others	5	Cognitive flexibility
Emotional intelligence	6	Coordinating with others
Judgment and decision-making	7	Judgment and decision-making
Service orientation	8	Emotional Intelligence
Negotiation	9	Service Orientation
Cognitive flexibility	10	Negotiation
		+Adaptability

In the relisted skillsets, the top 3 remain in their spots. However, 1 and 2 interchanged **critical thinking** as the topmost priority. The participants collectively described critical thinking as the ability to use logic and reason to evaluate situations before prescribing a

solution. Similarly, Gray (2016) defined critical thinking as the ability to identify, analyze, and evaluate ideas, situations, and information in order to formulate responses to problems.

The participants reasoned that developing critical thinking among students is urgent because of their evident passivity. The participants commonly observed that students seldom question phenomena, information, or ideas, but rather take them at face value. When this passivity continues, students tend to be comfortable using technologies from other countries and lodging their actions from those technologies. This should not be the case, because in FIRe, for example, big data analytics are often better at storing, analyzing information, and providing decision support, but incapable of applying this data into developing pertinent solutions problems at hand. Hence, it is crucial for workers to be able to think critically, as they can use this skill to facilitate decision-making within the firm; many business leaders use this skill to make decisions, making them an asset to the company (Gray 2016).

Critical thinking as the most important skill to thrive in FIRe, strongly supported by the results of the WEF Executive Opinion Survey 2016–2017 on "critical thinking in teaching". In this survey, the respondents were asked: "in your country, how do you assess the style of teaching? (1 = frontal, teacher based and focused on memorizing; 7 = encourages creative and critical individual thinking)". Table 2 presents the critical thinking rank and value of legacy countries.

Table 2: Rank and Value of Legacy Countries' Critical Thinking in Teaching

County	Rank/100	Value
Philippines	35	3.8
Hungary	62	3.2
India	16	4.5
Lithuania	48	3.5
Mexico	82	3.0
Romania	95	2.6
Russian Federation	30	3.9
Slovak Republic	83	3.0
Thailand	78	3.0
Turkey	100	2.3

Information Source : Readiness for the Future of Production Report 2018

Complex problem-solving rests in the second slot. The participants agreed that this skill refers to using analysis to make decisions and execute solutions. In support of this ranking, the participants strongly argued that a person must be a critical thinker first before they can be a complex problem solver, as complex problem solving emanates from critical thinking by

prescribing solutions by thorough and systematic analyses rather than by intuition and emotions.

Creativity stays at the third rank. For the participants, creativity refers to thinking out-of-the-box or coming up with unique ways to produce new outputs. This skill can be particularly related to Filipino ingenuity, which is also observed in people of other legacy countries. With emergent technologies, workers need to have creativity in order to benefit from the changes. Creative people are able to look at the issue from all sides. This consequently helps them to come up with completely new and interesting solutions. Robots may increase the efficiency and ease of work, but they are currently still unable to be as creative as humans. For, to solving problems creatively and coming up with novel ideas can take companies in a new directions (Gray, 2016).

Interestingly, the participants situated **cognitive flexibility** at number 5 from its previous place at number 10. The participants were in agreement that cognitive flexibility is the ability to mix-and-match ideas, systems, processes, materials, and data to create new products and ideas. In a similar context, coreaxis.com (2016) defined cognitive flexibility as the ability to transition one's thoughts between multiple concepts or perspectives. It is the ability to process multiple concepts simultaneously, such as the perspectives of opposing viewpoints.

Cognitive flexibility is switching between different types of thinking dimensions and mindsets; it is working across multiple disciplines and extracting and integrating concepts from different fields. Today, being knowledgeable in one discipline only is not sufficient anymore. Interdisciplinary skills are now considered valuable for they enable employees to apply holistic and cross-disciplinary knowledge to a given area of work (www.avvanz.com, 2017). Participants sustained that cognitive flexibility is the ability to fit to the exponential nature of development in industry 4.0. It is imperative to possess this skill so that one can go along with the volatile changes brought about by developments in this era. This human skill is in contrast with the fixed intelligence of robots and other programmed machines.

When asked to add skills not on the list, the majority of participants listed **adaptability** as the most important. Basically, adaptability and flexibility are synonymous; both may refer to being open to positive or negative changes and diversity in the workplace (The Future of Jobs Report 2018). People who are flexible and have the zeal to understand and learn new technologies are sought after by organizations as part of their growth (Deepa and Seth, 2013). Employers want graduates who are adaptable and flexible, who are inquisitive, critical, innovative, and who are quick to learn and synthesize (Harvey and Knight, 1996; Deepa and Seth, 2013).

Skills for emerging technologies

The participants identified skills to approach the learning of and working with each emerging technology listed by the WEF in 2018. Table 3 presents these skills.

Table 3: Prioritization of Skills for Emerging Technologies

Emerging Technology	Prioritized Skills
Artificial intelligence and robotics	Critical thinking Complex problem solving Creativity Cognitive flexibility
Ubiquitous linked sensors (Internet of Things)	Complex problem solving Critical thinking Creativity Cognitive flexibility
Virtual and augmented realities	Creativity Critical thinking Complex problem solving Cognitive flexibility
Additive manufacturing (3D bioprinting)	Critical thinking Complex problem solving Creativity Negotiation
Blockchain and distributed ledger technology (Cryptocurrencies, bitcoin)	Complex problem solving Critical thinking Negotiation Creativity
Advanced materials and nanomaterials	Critical thinking Complex problem solving Creative Negotiation
Energy capture, storage and transmission	Complex problem solving Negotiation Coordinating with others Judgment and decision-making
New computing technologies (Quantum computing,	Complex problem solving Critical thinking Negotiation

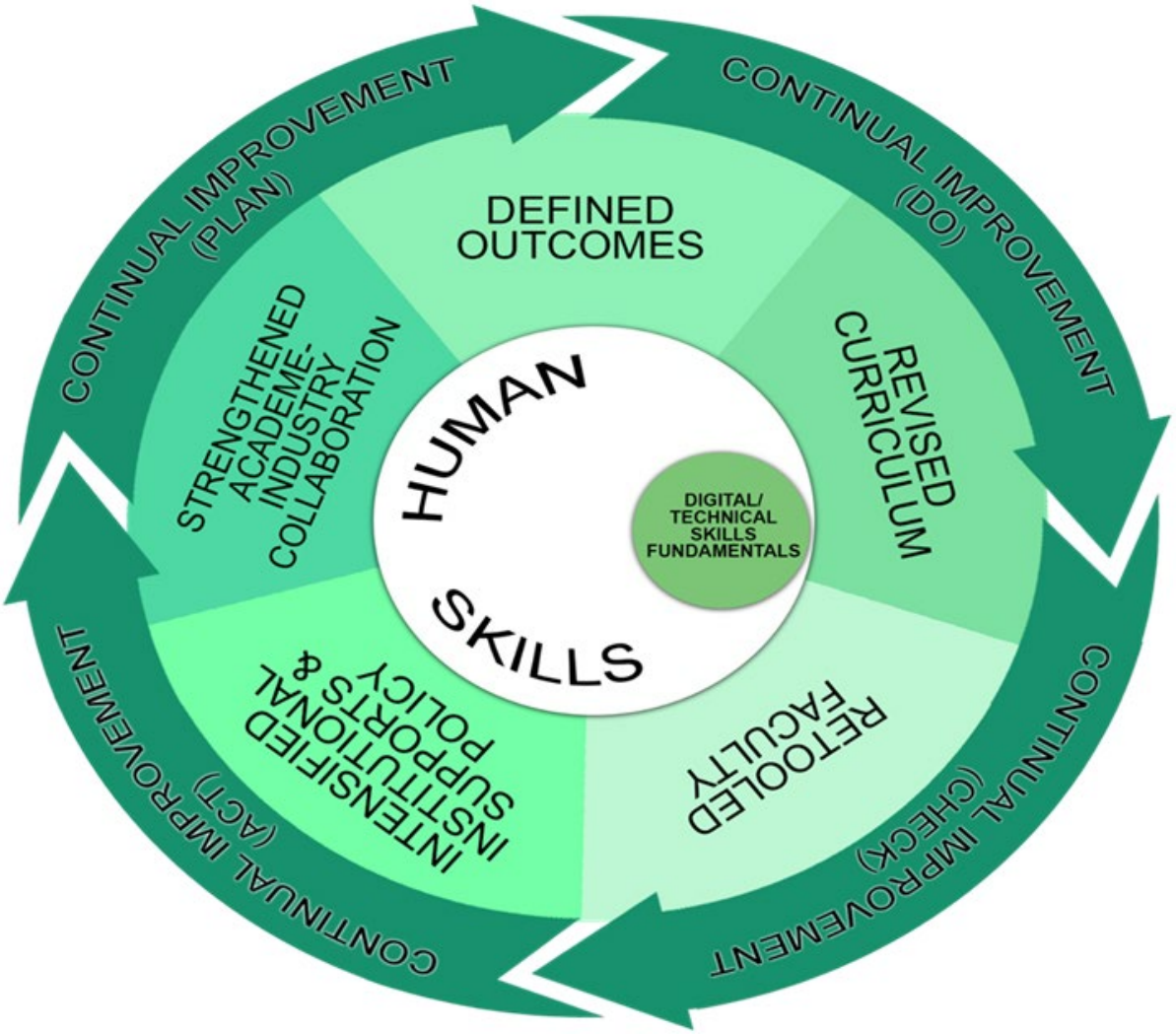
Biocomputing)	Judgment and decision-making
Biotechnologies (Genetic engineering)	Complex problem solving Critical thinking Negotiation Creativity
Geoengineering (Planetary system, climate change)	Complex problem solving Service orientation Negotiation Critical thinking
Neurotechnology (Smart drugs, neuroimaging)	Complex problem solving Judgment and decision-making Service orientation Negotiation
Space technologies (Space exploration, microsatellites, rocket-jet engines)	Complex problem solving Critical thinking Coordinating with others Negotiation

Consistent to how the participants re-ranked the skills by order of priority, the top 3 skills – complex problem solving, critical thinking, and creativity – are considered most applicable to each emerging technology. Cognitive flexibility is also considered especially necessary for AI and robotics, ubiquitous linked sensors, and virtual and augmented reality. These technologies obviously require multiple tasks, processes, and systems, thereby requiring flexibility of the mind. Remarkably, skills like coordinating with others, judgment and decision making, service orientation, and negotiation are recognized for technologies directly affecting human beings and the environment. The participants distinguish these skills as people-oriented skills and social skills.

Contextualizing human skill education and the management role

After identifying the focus of education, the participants proposed some doable approaches to contextualized human skill education (CHSE). CHSE relates contents to meaningful situations that are germane to learners' lives and offer practical ways for effective learning. The participants believed that different country archetypes have varying contexts of educational needs. Hence, the following framework may only be practical to a legacy country.

Figure 1. Contextualized human skills education (CHSE) framework for legacy country



Defining intended outcomes

The CHSE starts with the ends in mind. Oftentimes, it commences with consensus-building as to what qualities the graduates shall possess and whether these qualities are apt to thrive in both FIRe and a legacy economy. The defined graduate qualities form part of the vision of an educational institution to which all stakeholders anchor their actions. For example, considering the top three skills, a university can envision graduates who are critical and creative problem solvers. The role of education managers is to ensure that the university's vision and intended learning outcome is clearly spelled out, and realized in all aspects of the curriculum such as, but not limited to, learning competencies, teaching-learning activities, and assessments.

***Revising curriculum and innovating instructional materials*:**
After defining outcomes, curriculum revision comes next. CHSE requires curricular realignment, if not total reform. It calls for redesigning instructional materials (IMs) to make them relevant to students. In this kind of education, the faculty often derive instructional resources from industry inputs and experiences. The management's role is to work with curriculum designers to ensure that the curriculum and IMs are contextually pertinent, authentic, and significant to the students and helps them appreciate the value of soft skills to their future careers. For example, the curriculum must be multifaceted or interdisciplinary in order to develop cognitive flexibility among students. Abdullah (2012) stated that education and training systems can supply the soft skills, but they must be effectively deployed in the curriculum.

Retooling Faculty

While retooling the students towards the desired skill outcomes, it is equally imperative to retool the faculty who shall facilitate the teaching-learning process. The retooling shall focus on aspects like curriculum development and implementation and assessment conduct and utilization. The training and retraining of faculty aims for better understanding and generating course content to exploring how to teach in a contextualized manner (DeLott, 2009). In this endeavor, the education managers shall assist the faculty by providing financial and logistic support for retraining.

Strengthening internationalization and academe-industry collaboration

CHSE may not be achieved in isolation of an educational institution; it requires partnership and collaboration. Considering that dispersion of technology in most legacy countries depends both on access to and absorption of foreign technology, universities may forge strong collaboration with other universities and industries in leading countries. This effort will realize faculty and student exchange, scholarships, and immersion, to mention a few. Soft skills are better learned at activities during the university years, like apprenticeships, voluntary work and projects, and international and domestic travel (Arat, 2014). More importantly, this will facilitate bench learning of the leading countries' best practices and exposure to their work places and emerging technologies where they are not yet abundantly available in a developing country like the Philippines. More than financial and logistics, education leaders can offer their representation and lobbying support.

Intensifying institutional support and policy making

Strong institutional support contributes to the success of CHSE. This support comes in various forms such as funding for curricular reform, instructional materials development,

faculty retooling, students' on-the-job-training, and apprenticeships. Sustainability of support may be achieved by establishing policies to that effect. The education managers shall perform policy-making and endorse outputs to appropriate agencies for implementation. For instance, they shall recommend regulations to maintain fair employee rates and flexible labour market, otherwise, the substitution of machines for workers will hasten (Paqueo and Orbeta, 2016; Dadios*et al*, 2018).

Institutionalizing continual improvement

The integrated characteristics of CHSE mandates its continual improvement. The participants advocate the application of the PDCA (Plan, Do, Check and Act) Principle to aid for the CHSE modifications if necessary.

Conclusion

Contextual learning is a good way of acquiring soft skills.

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