# ICT and Creativity: How ICT Impacts Creativity in a Saudi University

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**Abstract.** This paper discusses how Information, Communication and Technology (ICT) systems interact with and impact creativity in one higher education institution at Saudi Arabia. It adopts a qualitative case study methodology and utilizes the organizational creativity theory, which guides the data collection and analysis. The study finds that personality, cognition, and motivation play a role in the impact of ICT on creativity in a major Saudi university. It is useful and beneficial for organizations to understand how ICT impacts creativity in order to be competitive and ensure growth in their industries. Through ICT, universities have become more innovative in their administrative and academic functions; this is important for stakeholders in order to gain benefits from ICT systems in key areas, such as creativity. This study is useful in enabling university managers and employees, as well as ICT specialists, to gain an overall view of the consequences of implementing ICT in universities in a country like Saudi Arabia.

**Keywords:** ICT · Organizational creativity · Case study · Universities

## 1 Introduction

Organizations such as universities, particularly those in developing countries, face the need to innovate in their practices and managerial processes. This creates the further need for a creativity culture in universities to improve productivity and be more effective and efficient. Organizational creativity means employees creating valuable and useful new products and services, or new ideas and procedures in an environment that tends to be complex [1]. However, the question of how ICT systems can interact with and impact the process of creativity and innovation in universities' managerial and administrative functions is important. It is widely known that organizational creativity benefits from ICT systems, which help organizations achieve their potential and improve the process of creativity in general; however, there is a need to define and realize the processes to achieve this. Briefly, this paper studies the existing problem via a case study of a university in a Saudi Arabia.

Most previous work on this subject has explored related research topics such as the definition of organizational creativity [1], individual and organizational creativity mechanisms [2], issues influencing organizational creativity [3], the influence of technological systems such as knowledge management (for example by authors such as Shahzad et al.

[4]), issues influencing creative thinking [5], and the influence of organizational issues such as climate and resources [6]. In relation to the influence of ICT on creativity in organizations, studies by Chulvi et al. [7] and Dewett [15] have investigated this issue, and the topic of virtuality and its influence on creativity has been studied by researchers such as Martins and Shalley [14].

The purpose of this paper is to study how ICT impacts creativity in a Saudi university. Being aware of how ICT systems interact with and impact creativity means knowing the factors that lead organizations to be more sustainable and powerful in terms of achieving their vision and objectives. It has been proved that creativity helps organizations be more competitive and increase their revenue. Whether it is a private organization that aims to generate profit or a public organization that aims to improve the services it provides citizens and reduce its expenses, creativity must be part of a long-term strategy for the organization.

The contribution of the paper is knowledge of how ICT systems can impact creativity. It shows how certain factors can impact creativity, which can in turn influence the growth of the organization and increase the competitiveness of the organization in the higher education industry.

## 2   ICT Systems and Organizational Creativity

Organizational creativity is recognized as the formation of a valuable, worthwhile novel product, service, idea, procedure, or process by people working together in a complex environment [31]. ICT is defined as a wide-ranging combination of hardware, software, network infrastructure, and media that allows the processing, storage, and sharing of information and communication between humans and computers, locally and internationally [13].

Organizational creativity focuses on a number of issues, for example on the idea of novelty in organizations and on the creativity produced; however, this creativity has to be useful. It is important to mention that innovation is produced as the result of organizational creativity practices performed in organizations [9]. However, ICT systems can impact innovation and competitiveness; ICT tends to encourage innovation in enterprises, as it helps produce new products and/or services, as well as new processes, which help organizations become more competitive [16].

Organizational creativity has a number of features, such as that organizations must provide the tools, capabilities, and formal methods that encourage creativity [2]. ICT provides the systems and tools needed to achieve and encourage organizational creativity, and some authors have published guidance on how to design these ICT systems (such as Olszak et al. [17]), as they must solve a particular problem by providing the right information resources and information analysis to help produce new ideas, evaluate and select from new ideas, communicate the new knowledge in a way conducive to innovation and, finally, creating knowledge evolution in the organization.

It is believed that the originality of the team comes mainly from the incorporation of individually held expertise of team members at the team level [19]. However, organizational creativity also has some mechanisms for individuals or organizations, as explained by Bharadwaj and Menon [2]. As stated, these mechanisms must be meaningful, novel,

and related to the working environment, and organizations must have mechanisms, such as tools and approaches, which facilitate creativity in the organization. It is argued that substantial ICT use negatively moderates the relationship between knowledge collection and organizational creativity [18]. Knowledge Management Systems (KM) have a positive impact on creativity, which leads to better organizational performance [4]. However, high-performance work practices lead to more organizational creativity when the enterprises experience organizational change; workers' collective learning also has a role to play and can influence organizational creativity [8].

Having an innovation lab in an organization has a positive impact on creativity and on members' attitudes to it. This kind of facility has important conceptual elements, specifically providing a *time* and *place* to engage in creative thinking and the *technology* to facilitate such a process. Also, ICT with organizational changes lead to productivity progress, as well as high degrees of innovation [20].

Organizational climate and work resources are closely linked to creativity and innovation in organizations, and also lead to improved organizational employee well-being [6, 21]. This climate, if accompanied by conflict in the project life cycle, can be one of many predictors of group creativity [10]. There are five further factors that are related to innovation if accompanied by work motivation, which can play a role in organizational creativity, namely: organizational encouragement, supervisory encouragement, work group support, sufficient resources, and challenging work [11]. However, some studies have shown that ICT permits strategic innovators to rapidly evolve their business models rand so protect themselves from competition [22].

Handzic and Chaimungkalanont [12] demonstrated that there exists a convincing and significant positive relationship between informal as well as organized forms of socialization and creativity. ICT may facilitate socialization and knowledge-gathering, as well as improving routines to enable innovation [23]. Thus, ICT can have an important role in creative development actions. Specifically, ICT has the capability to connect employees, codify knowledge, and increase boundary spanning, ICT may also present an important motivation for promoting creative action [15]. This is through the information and knowledge that ICT systems provide to organizations which can connect employees, improve communication and increase geographical reach and participation.

From this review of the literature on organizational creativity and ICT, it is clear that there is a lack of studies explaining the processes of how ICT interacts with and impacts creativity in organizations such as higher education institutions, especially in developing countries such as Saudi Arabia.

## 3   Theoretical Framework

To theoretically understand organizational creativity and its impact and interactions with ICT, a theory with this focus is needed. The interactionist model of creative behaviour developed by Woodman et al. [31] includes descriptions of creativity from personality, cognitive, and social psychology perspectives. In this model, creative behaviour is seen as a complicated person–situation interaction. Antecedent conditions occur depending on the current form of the person and their interaction. Antecedent conditions that influence creativity contain past underpinning history (learning), early socialization experiences, and background characteristics such as gender and socioeconomic status (SES) [31].

The interactionist model of creativity explains individual creativity as being the result of certain antecedent conditions that impact the personality and cognitive features of the individual and can determine the present situation of the organizational actors [32]. These include mental styles and abilities, which relate to creativity. Research has highlighted eight main factors involved in idea production, which are: associative fluency, fluency of expression, figural fluency, ideational fluency, speech fluency, word fluency, practical ideational fluency, and originality or personality. In addition, there are certain traits, including experience, broad interests, attraction to complexity, high energy, independence of judgement, autonomy, intuition, self-confidence, and capability to fix conflict that all help an individual to be creative.

There are also a number of motivational factors, for example evaluations and reward systems, that may impact intrinsic motivation to achieve a creative task, as they draw attention away from the heuristic elements of the creative task and toward the technical elements of task performance and knowledge, where it is important to look closely at the part that knowledge and expertise show the capability of employees to be creative [33]. Some authors, such as Amabile [34] identified both "domain-relevant skills" and "creativity-relevant skills", as being important for creativity. These two types of skill include the knowledge, technical skills, and talent needed to yield creative products (domain-relevant skills) as well as the cognitive skills and personality traits related to creative performance (creativity relevant skills) [31].

## 4    Methodology

This research adopts a qualitative methodology, which is used to understand meaning, with an emphasis on knowing how organizational employees understand the way ICT interacts with and impacts organizational creativity in a Saudi university, as the main study of the research. Additionally, it is important in this qualitative study that the researcher interprets and understands the experiences of different events related to ICT and creativity, with a focus on the relevant actors and participants individually [24].

An interpretive case study research strategy is adopted [34, 35], focusing on the phenomena of ICT and creativity in one Saudi university. Theory is used as the main tool for enabling and guiding data collection and analysis. The data collection tools used were semi-structured interviews and the main sample that was targeted for this research was organizational employees as users and managers in the university and IT professionals such as systems analysts, programmers, implementers, and testers. The snowballing sampling method was applied, beginning with the manager of electronic services, who recommended the next interviewee. This process was followed in each interview, giving a total number of participants of 30. Data was analyzed first by transcribing the interviews, then arranging the data into themes, then explaining and interpreting those themes by using the theory and using literature to support the findings.

The formulation of the questions, and thus the data collection and analysis, were influenced by the interactionist model of creativity. The questions were as follows:

1. How do you see the status of creativity in the university?
2. How do you see the influence of ICT on creativity generally in the university?

3. How does ICT influence personality and how does this influence on personality impact on creativity at the university?
4. How does ICT influence cognitive styles and their impact on creativity, how can ICT influence thinking at the university, and how does the way employees think impact on creativity?
5. How does ICT influence the motivation of university employees, and how does this impact on creativity?

## 5   The University, ICT, and Creativity

The data was collected at a university in Saudi Arabia; the university was founded in the mid-1950s and is one of the largest in Saudi Arabia. The university is funded by many sources, including government funding, its own endowments, and student fees. It is managed by a president who leads its highest council, the main decision-making body in the university with high authority. Under the president of the university, there are four vice presidents with duties related to academic issues, postgraduate study and research, and development and quality, and one vice president who is responsible for managerial and financial issues. The university also has many supportive deanships, such as one for electronic services. The deanship for electronic services played a key role in this study, as most respondents worked within this deanship, which plays a leading role in the use and implementation of ICT systems in the university. The university has more than 50,000 students (male and female) and employs more than 10,000 people, making it one of the largest universities in Saudi Arabia and the region. The university has ICT systems for many functionalities across management, research, and teaching. For example, it has a large Enterprise Resources Planning (ERP) system that supports managerial and financial functionalities, and various systems for different purposes in specific operational activities. One IT employee (YT) explained further that:

> ICT systems play a role in the running of everyday activities, as they provide information and knowledge and support decision-making. They also help managers and employees to operationalize everyday activities via automation. It has moved the operations of the university from manual work to automation of most activities in the university.

It was first necessary to establish how ICT systems influence creativity in general. According to one interviewee, an IT manager at the university (AC):

> In general, ICT systems are built based on algorithms in one form or another. The main aim of those algorithms is to increase the effectiveness of work and reduce human intervention. It is important to mention that if the organization understands the potential of ICT systems and agrees upon their correct use, and if the ICT systems are introduced in the university (or any organization) in the right way, they can lead the organization to focus on its routines. This is reflected in the ICT systems and in this way, you give employees time to think, reflect, and be more creative. However, if different people at the organization see the ICT systems as a threat to their interests, this could negatively influence their creativity.

ICT systems also play an important role in the creative activity in organizations, where managers encourage and are enthusiastic about risk-taking and push for idea generation at all levels of the organization. The information and knowledge produced by ICT systems will promote greater creativity as a result. Another influence on creativity at work is the degree to which managers are able to closely monitor their subordinates through ICT systems, which will encourage creativity [15]. One interviewee, a systems analyst (QW) provided some insight on this point:

> The main aim of ICT systems is to help operations and carry out processes in the system instead of manually, but this requires organizations to show employees how to use such systems in the right way and realize their potential at all levels, even in risky situations. We have produced many new ideas for how ICT systems can help and serve the university; we have introduced and innovated various applications and systems for different functions. Idea generation, which leads to creativity, requires a high level understanding of the organization and benefits from the ICT systems used in the university processes. ICT provides the information and knowledge needed to improve decision-making, and this must be clear in the requirements analysis before systems development and implementation. This will enable the organization to focus on new products or innovating in current processes and develop new solutions to challenges faced by the university.

Employees with a high level of extraversion and openness to new experiences tend to be creative [25]. People with a high level of ICT experience understand how ICT can benefit the organization and enjoy using ICT applications in the organization; as a result, they tend to advance creativity in their organization. Employees with an intrapreneurial personality in relation to ICT are more likely to produce new ideas for how ICT can benefit the organization and, as a result, this intrapreneurial personality plays a role in innovative behaviour in the organization [36]. There is also a need for organizational employees and managers to be more committed to innovation; appetite for risk and reward, competition, and self-confidence all are important if organizations wish to advance creativity. Thus, creative intention among ICT specialists requires openness to experience, extraversion, conscientiousness, and knowledge collection behavior [26]. One interviewee, a systems tester (AQ), explained:

> ICT systems increased the level of experience and knowledge of all aspects of work in the university. This has led to employees feeling happier and enjoying work, which in turn has led to creativity. Knowing how to use technology increases awareness of how ICT systems can benefit work and this has encouraged employees to think of new solutions to challenges faced by the university. ICT systems have many processes related to many operational activities and operate in a fast and quick way, which has increased both productivity and employees' business knowledge of the university. As a result, creativity has increased in terms of how to employ ICT systems to move the organization in an innovative direction.

The technical potential of ICT systems is not only a trigger of creativity, but also of other outcomes, such as the financial gains that result from cost savings in the running of managerial activities in the university. ICT systems have led to fewer people being

needed to carry out work in the university and a reduction in the time needed to finish such work. These savings encourage and provide the grounds for creativity to be a reality in the university, with the aid of ICT systems. Another interviewee, a systems implementer (AW), reported that ICT systems have many advantages that can help enormously with creativity:

> ICT decreases costs and increases competencies and effectiveness. The idea that I am trying to express is that ICT systems lead to automation of work that used to be performed by humans, for a lower cost. Also, previously employees had to process transactions manually to produce knowledge, such as calculations; now, systems can perform this function, giving the employees more time to think and make decisions based on the knowledge produced by the systems. This has given employees the time to be creative and innovative as a result.

However, one important factor is losing trust in the organization due to not believing the mission put forwards or the information and knowledge provided by the system; this can reduce the acceptance of ICT systems and thus the creativity needed by the employees in the organization. One interviewee (QE), a systems developer, said:

> Stakeholders have an interest in ensuring that the ICT systems in the university work and perform their mission properly. ICT systems may increase or reduce the strength of alliances in the organization. There is a need to reach an agreement on the mission of ICT systems, otherwise they can be a negative factor affecting the creativity of employees. If the systems do not perform the required functions and work as expected to, the employees will lose trust in the ICT systems used in in the organization; this loss of trust will discourage innovative behaviour in the organization.

Cognitive theories tend to focus on thinking and information processing. In regard to creative thinking, thinking becomes creative if it tends to be original and generates adaptive ideas, new solutions, or insights. Creative behaviours and products are usually described as original and adaptive [27, 37], and the processes which generate original and adaptive ideas, solutions, and insights are considered creative processes. One IT systems analyst (ER) described and explained this point further:

> ICT systems influence thinking in the organization and this influences creativity within the organization. ICT systems process data, which plays a role in creativity in the university. A famous psychologist, Daniel Kahenma, says that humans have two systems for thinking, one for fast thinking and decision making and the second for slow thinking and analysis. ICT systems work according to fast thinking and decision making, meaning they give people more time to think and focus on the decision-making that ICT systems support. You can notice that the majority of workers have become decision makers as a result of introducing such systems.

It is also important to say that different cognitive styles can improve user performance in information systems use [30]. However, sometimes, cognitive style insights are proposed as likely explanations for the communication difficulty that commonly

exists between system specialists and the users of information systems [29]. When there is a clear communication of the thinking and information processing among organizational employees and the university, a path for innovation and creativity is opened, as one ERP manager (AA) explained:

> Effective communication between management and other university employees and members clearly influences innovation. I remember when the university leadership was clear about its objectives; as it intended to improve operations and be open to future development, this allowed many employees to suggest ways to improve the performance of such systems and improve the organizational generally. It is clear that once one ICT system becomes successful, employees start to think about the next system and how it can benefit the organization. Therefore, clear communication from the university leadership regarding the vision and mission for new ICT systems played a role in later innovative behaviour related to the implementation and use of these systems.

Motivation plays a critical role in the creative process; it is not sufficient for an individual to have uncommonly great skill or a profound theoretical understanding. To achieve a high level of creativity, as shown in a study of creativity and students, it is necessary to participate in tasks for pleasure and enjoyment of the task [28]. Thus, motivation plays a role in enabling creativity in the different tasks performed by employees. According to one participant (AR):

> In the university environment, when we felt that there were practices supporting our work and provided incentives for us, this motivated us to engage and focus all our thoughts on ICT systems and the university's implementation of such systems. We were creative in terms of how to use the systems and in understanding our requirements and how these were reflected in the ICT system. We understood routines and how ICT systems could play a role in improving those routines and the university performance. You could see that this was our main creative achievement. We used to participate in agile meetings at the time of ICT systems implementation, which were enjoyable; we listened to everyone's views, which led to a successful implementation.

All the aforementioned impacts can result in improving the competitiveness of the organization in comparison to its rivals. For example, motivation improves the performance of the employees of the organization; this leads to creativity, which can improve the competitive situation in the industry the organization operates in. In the university, according to one participant, a systems developer (RT):

> Once, the university provided incentives to employees who supported the system implementation. Incentives, which included pay rises, played a critical role in making the implementation and later use successful, as they motivated employees to perform better. This better performance encouraged employees to think in creative ways about how the system, and future systems, could serve the university's needs. The university became a leader in higher education in terms of ICT and

university operations, and we were asked to help other universities to implement such systems and achieve similar savings.

This improvement in performance and competitiveness as a result of creativity facilitated during the implementation of ICT systems led to university growth by improving decision-making processes and staffs' skills in dealing with the problems associated with the ICT systems' implementation and later use, and also improved the quality of work produced with the aid of such systems. One participant, a systems implementer (AQ), said:

I remember how unorganized the work used to be before the implementation of the ICT systems in the university. The quality of work produced, in regard to the information and knowledge gained and its accuracy, has improved on the previous situation before such systems were used. This has influenced the growth of the whole university in terms of improved employee skills and cost savings, which can be used in different areas.

## 6   Conclusion

This research has shown that ICT systems interact with and have an impact on creativity. It has highlighted that certain personality traits, such as risk taking and idea generation, can emerge as a result of the information and knowledge provided by ICT systems. People who are open to new experiences tend to be creative; ICT systems also impact creativity also when people enjoy using such applications, as when employees experience problems related to the implementation or use of such systems, this will negatively impact creativity – the opposite is also true. Competition and having an intrapreneurial personality are also shown to have an impact on creativity during the process of implementation or use of such systems, and as well as trust in the process of implementing and using ICT and its results.

ICT systems also impact creativity when the system leads the organization to generate new and original ideas that can be adapted within the organization. When the systems help to communicate new insight for the organization, this plays a role in producing innovative behaviour.

The limitations of this study include its focus on one organization only. There is a need to include more case studies across different types of organization and employ a variety of methods, such as surveys or mixed methods.

Nevertheless, the findings of this study are useful for universities and similar organizations to help them understand how ICT systems can impact creativity. They can use the ideas and results to ensure that new ICT systems will lead to multiple benefits, such as encouraging creativity. It has been proven that creativity can impact the competitiveness of the overall organization and it influence its growth and effectiveness.

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